# THE HEATING AND VENTILATING MAGAZINE

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Vol. XVI. No. 1
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JANUARY, 1919

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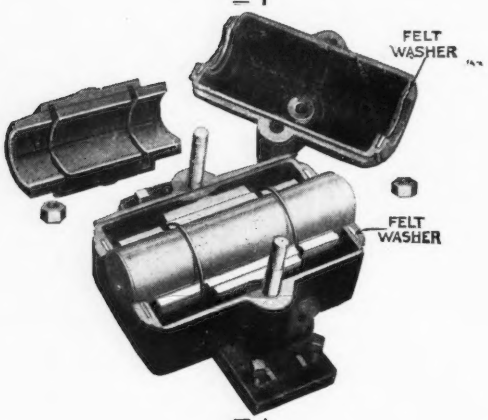


Choosing a well made fan, one which will give complete satisfaction through years of the hardest service, is important. Choosing a fan equipped with a bearing which will protect it at the one point where friction occurs, is vital. Without such protection, even the finest workmanship is not worth having.

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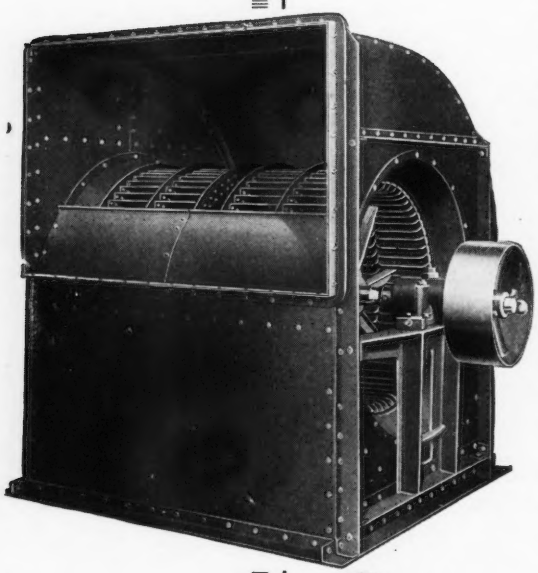

Study the illustration. This bearing, with its special construction, and the felt washer protection it receives, is beyond the reach of the finest dust particles, no matter how hard and sharp. The same construction which keeps grit out, keeps oil in.

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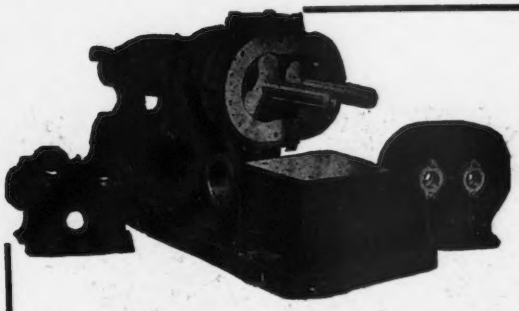

# Don't Make This Mistake

If you have made the mistake of installing a cheap, unsuccessful Rotary Pump, do not make the further mistake of concluding that all rotary pumps are worthless.

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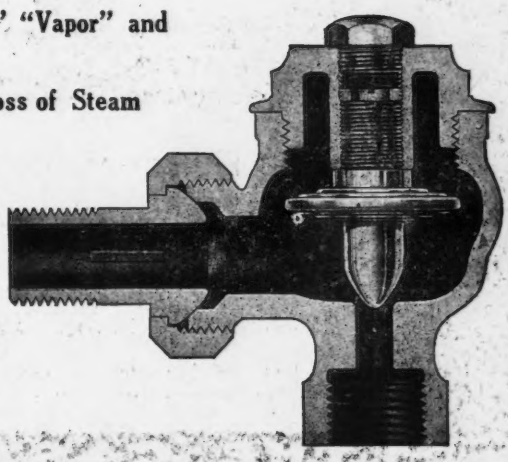

THE Marsh REFLUX Return Line Trap is for use on the return end of radiators of low pressure, vapor and vacuum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve, in order that it may accomplish what is desired of it, namely, to free the radiator of air and water without the loss of steam and to do so noiselessly.

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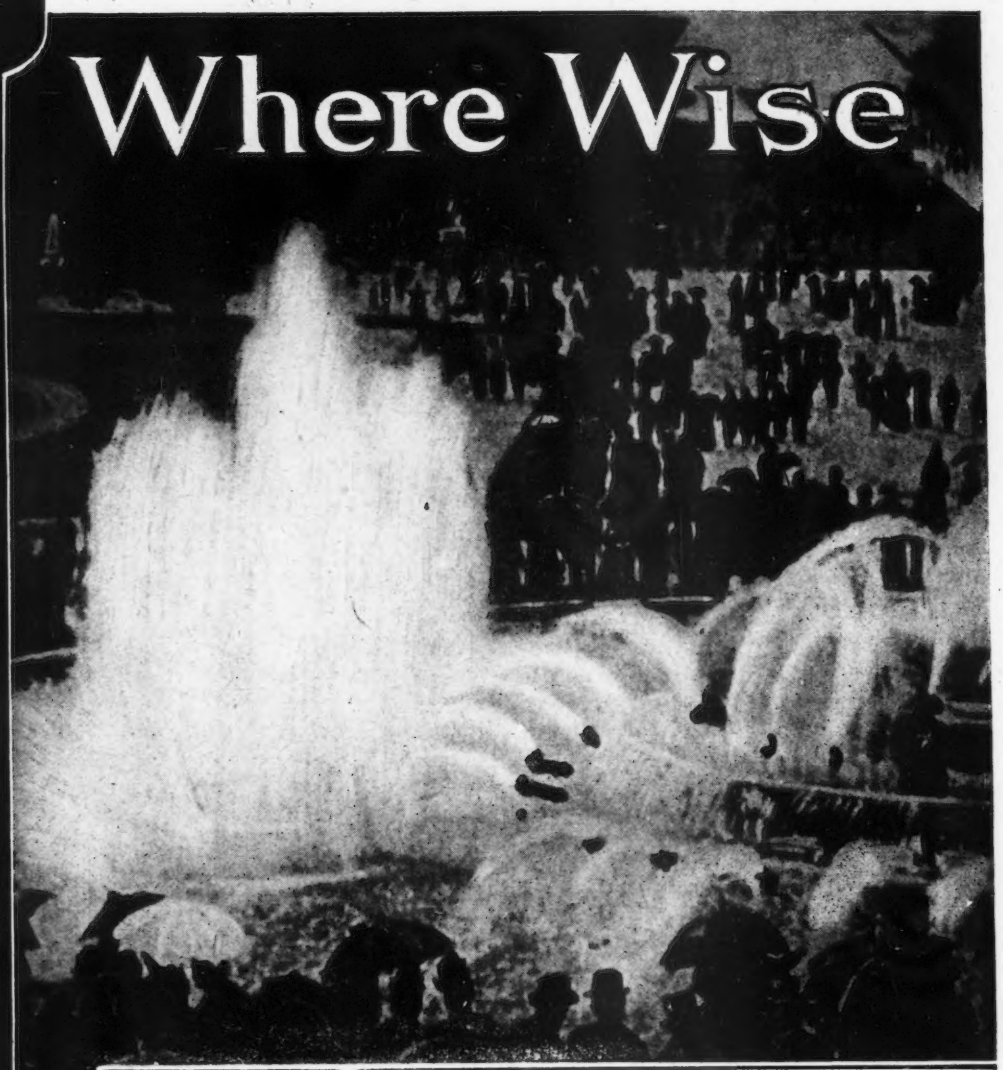


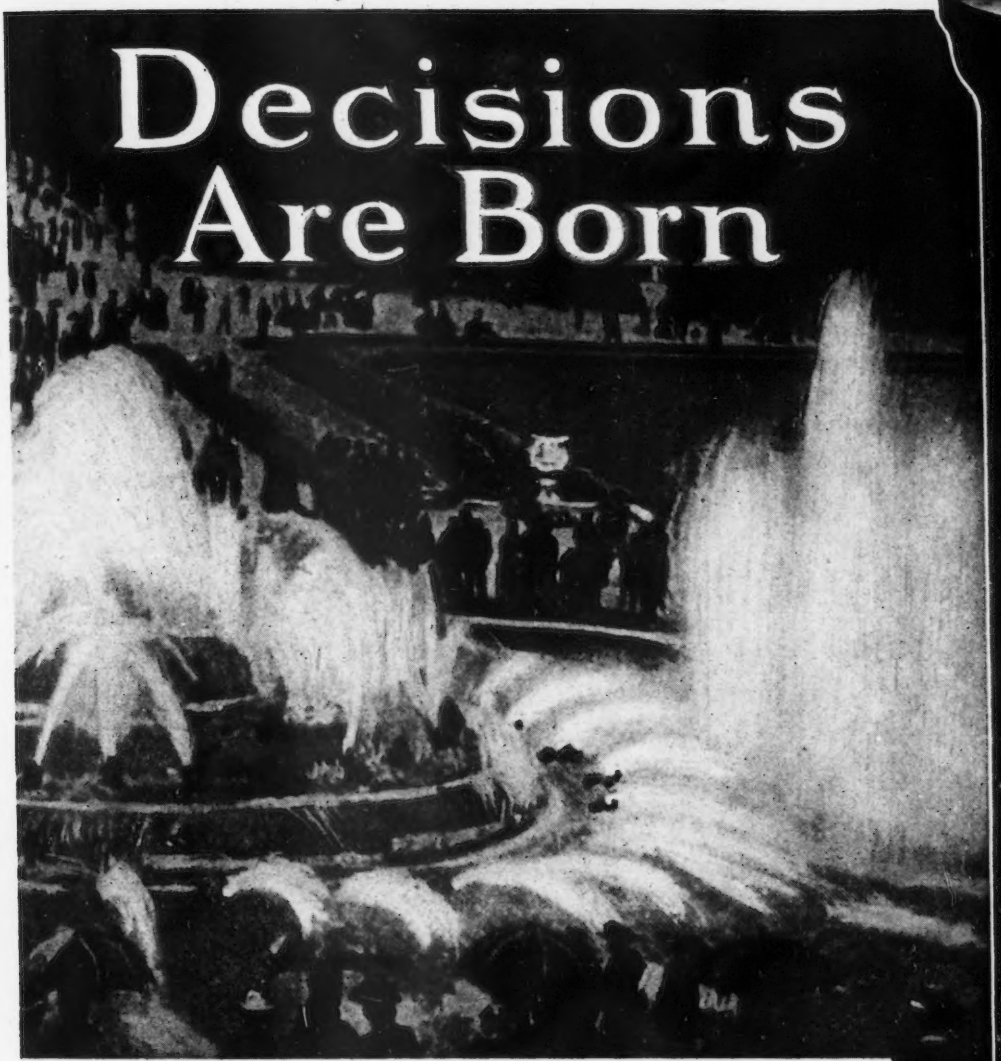
HERE at Versailles where Louis XIII and Louis XIV loved to dwell. Here at Versailles where the directors of France's destiny—King, Emperor, President—deliberated on affairs of state.

Here at Versailles the scene of court grandeur, the seat of the French Government from 1871 to 1879, the spot where Presidents of France are elected, the place where forty-seven years ago King Wilhelm of Prussia was proclaimed Emperor of Germany.

Here at Versailles is now gathered another group of men—Kings, Presidents, Diplomats—gathered to discuss the questions involved in the formation of a world

THE CAST IRON PIPE

# Decisions Are Born



League of Nations, and to dictate the terms of peace to be granted that power which dreamed the iron fist of Prussia could strike from the earth the rights and freedom of mankind.

Strength to those men representing the rightful power of Democratic Nations! Strength to those voting members of the great International Peace Conference! Strength to the military and naval leaders! Strength to the men of Army, Navy, Factory and Forge whose representatives they are, and may the peace which comes from their effort prove as lasting as that Cast Iron Pipe installed by Louis XIV more than two and a half centuries ago which still survives to serve "Les Grandes Eaux" at Versailles!

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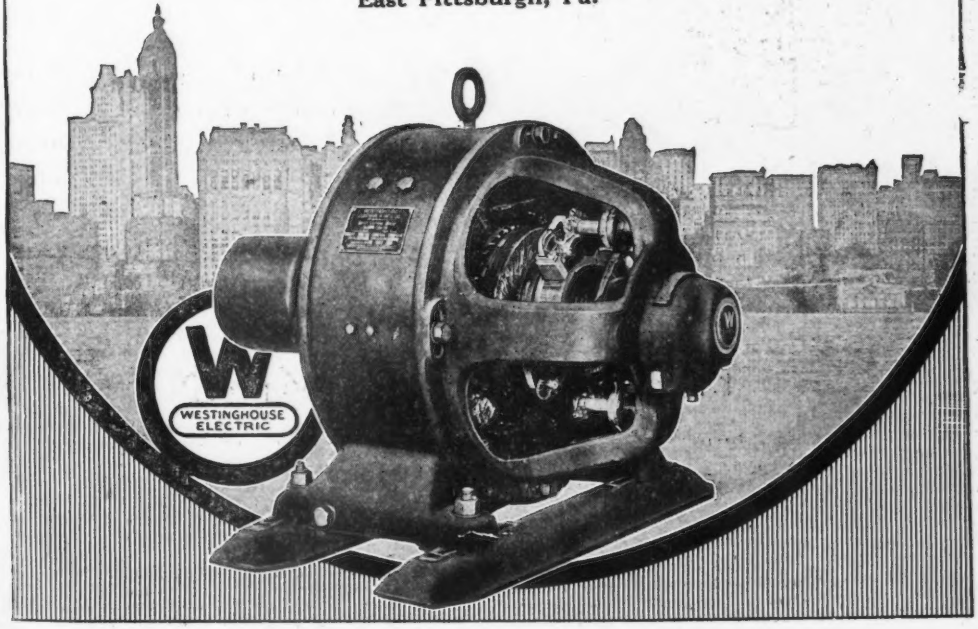

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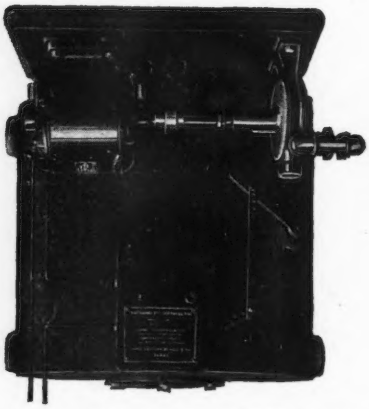

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79

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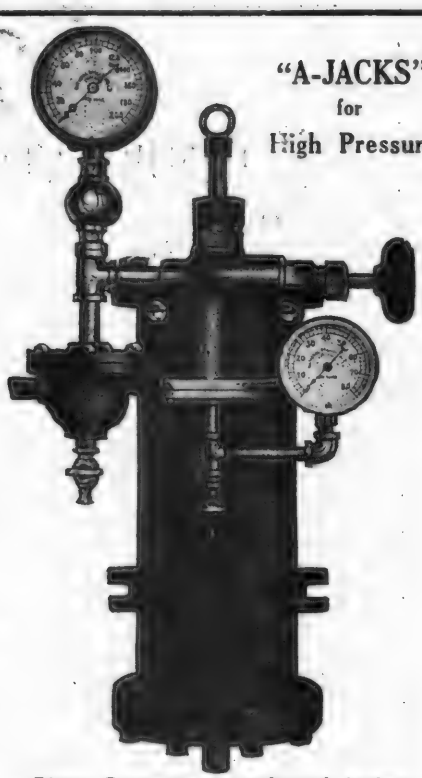

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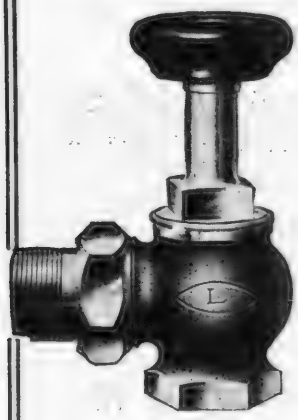

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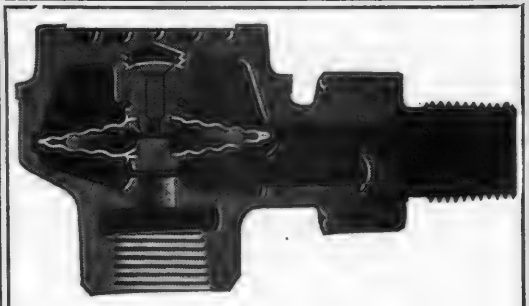

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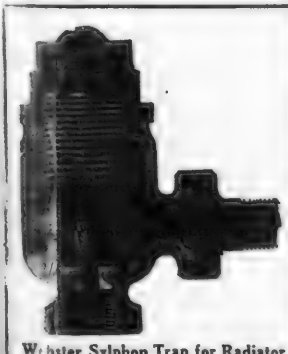

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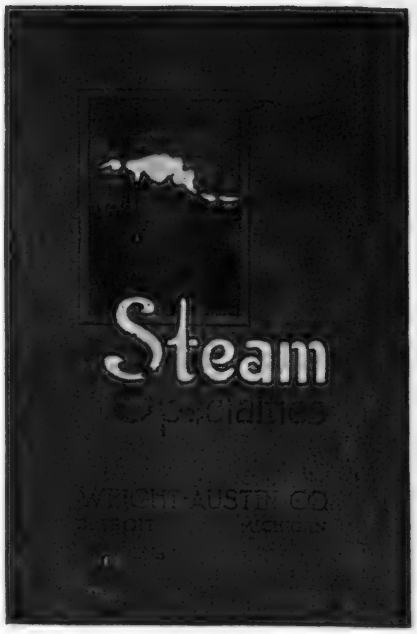


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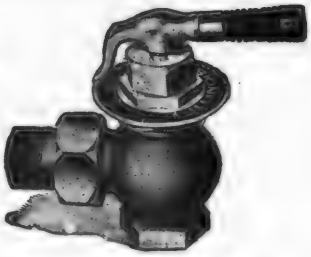

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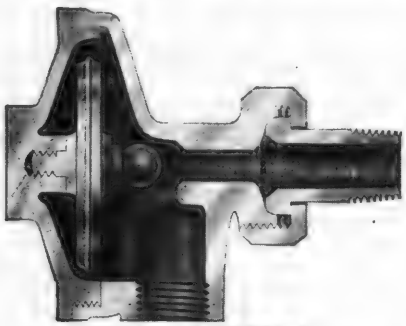

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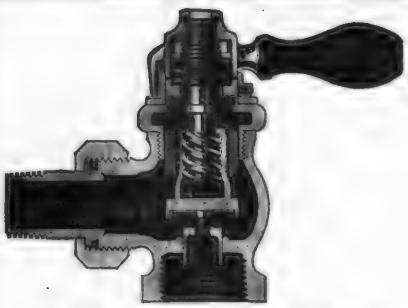
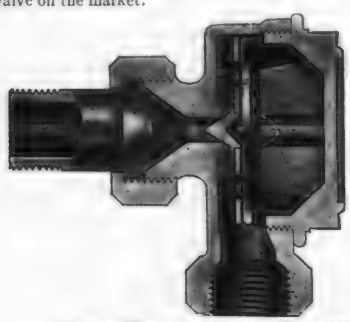


McAlear Packless Graduated Valve not only the handsomest graduating valve, but the simplest and of the best construction of any valve on the market.



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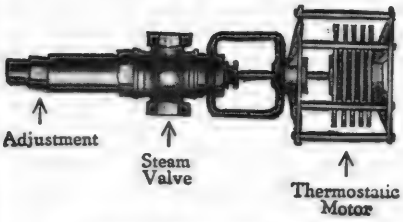


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THE HEATING AND VENTILATING MAGAZINE

JANUARY, 1919

# GOVERNMENT PUBLICATION ON REQUIREMENTS AND STANDARDS FOR HEATING AND VENTILATION

Closer Co-Operation Urged Between Employers and Owners of Industrial Plants, Together with Establishment of National Research Bureau.

An event of noteworthy importance to the heating and ventilating industry is the publication, under government auspices, of a report covering requirements and standards for heating and ventilation, which has recently been issued from the government printing office in Washington. The report itself, which thus receives official endorsement, was prepared by a committee on heating and ventilation, made up of Werner Nygren, of New York, chairman and Dr. Rudolph Hering. This committee is one of the divisional committees of the National Committee on Welfare Work, acting under the Committee on Labor of the Advisory Commission, Council of National Defense.

The recommendations are intended to apply to peace, as well as war, conditions. The difficulty of defining standards to cover the many and varying conditions encountered is carefully explained and the necessity for standards going further than those submitted is also pointed out. For the purpose of advancing and developing this work the committee recommends a national bureau of research, with power to regulate all matters pertaining to hygienic requirements for working and living quarters.*

The principal portions of the report are presented herewith:

## SCOPE OF NEEDED REGULATIONS.

In approaching the subject of regulating heating and ventilating we are confronted with two separate problems, one of meeting the requirements in new buildings and the other of meeting the requirements in old buildings already in use and oftentimes utilized for an entirely different purpose than that for which they were originally constructed.

For new building laws can be enacted to cover heating and ventilating along lines similar to those controlling building construction and plumbing, except that the laws for heating and ventilating can not be equally definite. Existing building laws governing both construction and plumbing work can be enforced almost literally with few exceptions. It may be assumed that 90% of the work can be carried out in strict accordance with predetermined stand-

* EDITOR'S NOTE.—*This should not be confused with the plan of The American Society of Heating and Ventilating Engineers to establish a bureau of research, which is now well advanced.*

ards, leaving only about 10% to the judgment of the officials, whereas in the matter of laws for heating and ventilating only a small percentage of work can be done according to predetermined standards, and the greater percentage will have to be done in accordance with judgment of special conditions.

RECOMMENDATIONS.

It is the sense of this report that if substantial results are to be obtained, the following procedure be taken:

First. That the Committee on Welfare Work of the Council of National Defense send a notification to all employers and owners of industrial establishments that this national body is actively engaged on measures for securing proper ventilation of all working quarters for the maintenance of health and comfort of the employees. It should also explain the necessity of the contemplated measures which will be undertaken for the purpose of creating a high health standard for the country's army of workers at home, and thus conserve and prolong lives to compensate for those lost on the fighting front. It should furthermore point out that there is no special reason to fear that the proposed measures will involve inordinate expenses inasmuch as proper ventilation usually produces results in the way of increased working efficiency sufficient to pay for itself, besides contributing to the conservation of the Nation's strength.

Second. That a persistent educational campaign and agitation be inaugurated by publishing articles on ventilation written in such simple language as may be readily understood by those who have no previous knowledge of the subject. Such articles should explain the benefits derived from proper ventilation and should be followed by statistics of health standards obtained from striking instances of well ventilated and poorly ventilated establishments. To exert the correct and desired influence all articles thus published should be along scientific lines but as free as possible from conflicting theories where these might lead to lack of confidence on the part of practical business men as to the result which can be secured.

Third. That consideration be given to the establishment of a bureau to supervise and control all matters pertaining to ventilation, and to gather and tabulate statistics of the respective health conditions. In connection with such a bureau there should also be a laboratory for research and testing work, in charge of a competent and well-paid personnel, to inspire the confidence necessary to prevent failure Such a bureau, we believe, will sooner or later have to be provided, and we feel sure that its creation would be appreciated by every health board and health association in the country.

Fourth. That the question of standards and their limitations be determined by the above suggested bureau according to results of its reasearch work.

LIMITATION OF WINDOW VENTILATION.

The recognized limitation of ventilating by opening windows is mainly responsible for the development of the mechanical methods. In crowded establishments the windows can not, under unfavorable weather conditions, be kept open sufficiently to accomplish the necessary air dilution without harmful and disagreeable drafts and chilling effects, and, moreover there are not always winds or other agencies to force in the required amount at such times as open windows can be tolerated. In other words, window ventilation is not to be depended upon nor can it be effectively controlled, and for this reason, it usually requires to be reinforced with positive and reliable agencies which will work when the natural agencies fail or are found insufficient.

This statement is not intended to imply that no ventilation can be secured through opening of windows, nor is it intended to support the old theory that

the opening of windows destroys the effect of mechanical ventilation when such is operating. From a hygienic point of view a room can not possibly have too many windows, nor can they be opened too often or too much when the external weather conditions permit this to be done without discomfort.

Opening of windows is often sufficient for ventilating small offices and private rooms where the occupant or occupants are at liberty to manipulate the windows for interchange of air to suit their own comfort, but in crowded establishments, where this is obviously impossible, open windows can not be tolerated except under the most favorable weather conditions. It is for this reason that additional means must necessarily be provided.

VALUE OF WINDOW VENTILATION.

In order to meet the situation intelligently, proper allowance should be made for the influence windows have on the indoor atmosphere; firstly, as to the unavoidable air leakage, which secures some ventilation even when the windows are closed; and, secondly, to the sterilizing effect which is obtained by the sunlight.

It is obviously unnecessary to provide any additional means for ventilating when the total window area is of such proportions that the accidental air leakage through the windows is sufficient for the supplying of the requisite air It is equally obvious that rooms having inadequate windows for accomplishment of this dilution need additional means for the supplying of the requisite air when the windows can not be opened without causing harmful drafts and discomforts to the occupants. Also that rooms having no windows or skylights whatsoever, particularly if such rooms happen to be interior rooms without any wall exposure, require to be specially well ventilated by mechanical means.

IMPORTANCE OF DESIGN.

The matter of design is in every case as important and vital to a successful accomplishment as the air quantities supplied. Many ventilating and heating installations which are ample in capacity are nevertheless inadequate on account of faulty arrangements due either to lack of study and consideration as to important details or else to lack of understanding by the parties responsible for the design. The heating and ventilating science is often considered so simple that the design of the apparatus is intrusted either to parties having little or no previous experience, or to manufacturers who are mainly interested in finding a market for their special appliances and who consider their duty accomplished when the apparatus they furnish delivers the quantities of air and heat contracted for. Yet the fact is, that if the apparatus is to be successful in maintaining proper atmospheric conditions, too much attention can not be given to detail of the arrangement of the apparatus and the distribution of the heat and the air introduced for ventilation.

**Standards for Heating, Ventilating, and Air Moistening.**

The following are the minimum requirements for the maintenance of acceptable conditions in all classes of factories, rooms, and spaces devoted to industries.

Under the head of working rooms are included offices, stock, sorting, shipping, wash, dressing, locker, and toilet rooms.

*Space per occupant.*—Two hundred and fifty cubic feet of space is the minimum for each occupant on the basis of the workroom being 12½ ft, or less in height. If the room height is higher than 12½ ft., at least 20 sq. ft. of floor space shall be allotted for each occupant.

VENTILATING REQUIREMENTS.

Rooms having windows whose area is equal to or in excess of 21 sq. ft. per occupant and which can be opened directly to outdoors do not require mechanical means for ventilation, except when injurious substances are generated or released to the room air or if undue heat is generated in such rooms.

All interior rooms, and rooms having less window area than 21 sq. ft. per occupant require apparatus for mechanical ven-

tilation which is to be operated whenever the rooms are occupied, except that such apparatus need not be operated when the external temperature and weather conditions permit keeping the windows wide open, provided the total window area is 5 sq. ft. or more per occupant. A positive supply of outdoor air from an uncontaminated source shall be supplied to each room under this class, the amount of which shall be as stipulated in the following paragraph and distributed in such a manner as to maintain the stipulated temperature without harmful or disagreeable drafts. Sufficient means shall also be provided for each room for exit of air corresponding in amount to the amount of fresh air supplied. The exit openings shall be so arranged that the movement of the air will be given a direction whereby it will come into maximum contact with occupants of the room, and shall, when necessary for satisfactory results in this respect, be provided with mechanical or other positive means for exhausting the air.

All rooms having a total area of windows opening directly to outdoors amounting to less than 21 sq. ft. per occupant require to be supplied with fresh air in the quantity of not less than 100 cu. ft. per occupant per hour for each square foot of window area lacking, with the exception that whenever mechanical ventilation becomes necessary in compliance with this provision the minimum amount supplied shall be not less than 600 cu. ft. of air per person per hour.

All rooms above the ground level having wall or ceiling exposure but no windows require to be supplied with 2,100 cu. ft. per occupant per hour.

All interior rooms having neither exposure nor windows opening directly to outdoor require to be supplied with a quantity of air per hour equal to five times their cubic contents, plus 1200 cu. ft. per hour for each and every occupant.

All underground rooms having neither exposure nor windows opening directly to outdoor require to be supplied with a quantity of air per hour equal to six times their cubic contents plus 900 cu. ft. per hour for each and every occupant.

Toilet, coat, and locker rooms require mechanical ventilation capable of exhausting air from such rooms in the following amounts:

Toilets, at least 10 complete air changes per hour, plus 1,500 cu. ft. per hour for each water-closet and urinal fixture.

Locker and coat rooms, at least six complete changes per hour, plus 600 cu. ft. per hour for each locker or each person's wearing apparel.

Sufficient air inlets for inflow of air to replace the air exhausted must also be provided for such rooms.

Areas of doors and skylights which can be freely opened may be considered equivalent to window area.

### REMOVAL OF INJURIOUS SUBSTANCES

Where dust, fumes, gases, vapors, odors, fibers, or other impurities are created or released in the course of manufacturing or processes carried on in the working spaces, tending to discomfort and injury of health of the occupants, there shall be special mechanical or otherwise positive means provided for removing such substances as fast as created or released.

In case of inability to completely collect and remove such injurious substances by the above specified means, additional ventilation will be required for dilution of the atmosphere beyond the standards given above as will be required to maintain its purity. The percentage of injurious substances permissible in the atmosphere should be determined by chemical analyses by the medical authorities. This provision shall cover all gas burned for illuminating or other purposes from which the products of combustion are released to the indoor atmosphere, and the allowance for such contamination by gas, etc., must be not less than 1,800 cu. ft. of fresh air per hour for each cubic foot of gas burned within the room.

When, in the opinion of the proper authorities, the fresh air supplied for the ventilating purposes is dust-laden to the extent of being unhealthful and unsuitable for ventilating purposes, it shall be filtered or washed by suitable appliances capable of removing dust and other mechanical impurities.

### EXCESSIVE TEMPERATURE AND HUMIDITY.

Excessive heat generated by manufacturing processes shall either be confined by application of nonconducting material or be collected and carried off in the same manner as described for the injurious substances.

Excessive heat or humidity or a combination of the two when sufficiently high to be injurious to health must be counteracted or reduced so that the relative humidity will not exceed 65% when the temperature exceeds 75° F., except when outdoor weather conditions prevent or when the working quarters are used for special purposes which, in the opinion of the proper authorities, require or make advisable other degrees of humidity.

### MINIMUM HUMIDITY.

The minimum relative humidity for the stipulated temperatures shall be not less than

20% and suitable air moistening appliances, which shall be controllable either by hand or automatically, shall be provided in the rooms or in connection with the ventilating apparatus for accomplishing the desirable air moistening effect.

HEATING REQUIREMENTS.

The temperatures in all factories, mercantile establishments, mills, and workshops require to be maintained at a uniform degree consistent with reasonable requirements of the manufacturing processes, ranging from 62° F., which is the minimum for rooms in which manual labor is performed, to 72° F., which is the maximum for rooms in which clerical or mental work is performed.

Apparatus for the required heating must be installed and operated to maintain the temperatures and be controllable within the stipulated temperature range and such apparatus must be of a character and type to cause no contamination of the spaces it heats.

All direct heating surfaces placed in rooms for heating purposes shall be so located and arranged that the heat radiation from the same will not cause discomfort or injury to the occupants.

When warm air is used as a heating medium the same must be so introduced and distributed as not to cause discomfort to the occupants. Warm air for heating must not be supplied at temperatures higher than 130° F.

Open salamanders must not be used under any circumstances.

Gas or oil heating appliances discharging their products of combustion into rooms must not be used unless a sufficient amount of fresh air is supplied to compensate for the vitiation of the air caused by the combustion. Gas heating appliances can be used without additional air supply being necessary if the products of the combustion are completely collected at the points where generated and carried off to the outdoor atmosphere.

REQUIREMENTS FOR DWELLINGS.

While it is as important to maintain pure atmospheric conditions in the homes as in the working quarters, it is neither reasonable to advocate mechanical appliances for ventilation of such quarters nor practicable to install same. We all know that both living and sleeping rooms, even of the dormitory kind, can be effectively ventilated by opening of windows if ample room is allotted per person. Consequently all measures for securing the betterment of conditions for living and sleeping rooms should be along the lines and standards of ample room sizes and liberal window space allotment per occupant. Along these same lines interior and underground rooms without windows opening directly to outdoors should not be permitted to be used for living and sleeping quarters under any condition.

As to the heating, ample provision should be made so that each and every room used for living and sleeping purposes can be heated to a comfortable temperature in the most severe weather. Sleeping rooms, which may usually be kept at somewhat lower temperatures, still rquire ample provisions for warming up in cases of illness of the occupants. The recognized average standard for heating of living quarters is 70° F., and this committee is of the opinion that it would be well to adhere to this standard, so as to have a certain surplus that will permit windows to be kept partly open.

As to the method of heating, hot water, steam, furnace, and open fireplace heating, and even stoves, can be considered satisfactory when ample in capacity and properly installed. Individual control of the heating for each room is very important, so that the heat can be distributed in accordance with the requirements. Heating by gas radiators and oil stoves, which release products of combustion into the room atmosphere, should be prohibited for permanent heating of living and sleeping rooms, inasmuch as they produce gases which are both disagreeable and injurious.

A matter which is fully as important as the methods used in an understanding on the part of the inhabitants as to the atmospheric requirements from a hygienic standpoint. Much good can be accomplished by supply of information regarding the necessity of keeping windows open for ventilation of both living and sleeping quarters, particularly in the latter. Overheating is a prevalent evil that should be advised against. For ordinary rooms an average temperature of 68° F. is, from the standpoint of health, preferable to a higher temperature, except where there are aged people who require slightly higher temperatures. For sleeping rooms a much lower temperature will suffice, except in cases of illness. Under ordinary conditions it is far better to have the bedrooms cool and with the windows open than with high temperature and the windows closed.

We suggest that the matter of ample space and window provisions for living and sleeping quarters be left with the Section on Housing of the Committee on Labor, and that the above advice regarding the hygienic requirements pertaining to temperatures and opening of windows for ventilation of living and sleeping rooms be incorporated in the propaganda on the general hygienic requirements issued by the Committee on Sanitation.

# NEW HEAT TRANSMISSION TABLES

## A Remarkable Compilation of Factors as Given by Leading Authorities Covering Latest Types of Construction.

By WILLIAM R. JONES,

Superintendent, Department of Buildings and Grounds, University of Pennsylvania.

IV (Concluded)

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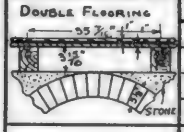
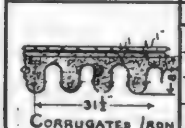
| FLOORS | THICKNESS | USED BY U. OF PA. A | RECHNAGEL & REITSCHEL C | THOMPSON H | HUBBARD L | HOFFMAN O | BUFFALO FORGE CO. J | NAT. DIST. HEAT. ASSO. R | AMERICAN RAD. CO. T | H&V MAGAZINE 1917 — V | HAUSS GEN. PRACTICE Y | IRWIN Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ARCH WITH STONE FLOORING | | .20 | .21 | | | | | | | | .20 | .20 |
| | | | DOES NOT STATE WHETHER FOR FLOOR OR CEILING | | | | | | | | | |
| SINGLE WOOD FLOORING ON BRICK ARCH | | AA | | | LL | OO | | | | WW | YY | |
| | | .09 | | | .15 | .15 | | | | .15 | .09 | |
| | | | | | | | | | | | GIVEN AS ARCH WITH AIR SPACE | |
| ARCH WITH SLEEPERS AND SINGLE FLOORING | | AAA | CCC | | | | | | | | | |
| | | .09 | .09 | | | | | | | | | |
| | | | HEAVY DUST AND WASTE PLASTER FILLING | | | | | | | | | |
| DOUBLE FLOORING   | | AAAA | CCCC | | | | | | | WWWW | | |
| | | .08 | .06 | | | | | | | .10 | | |
| | | AAAAA | CCCCC | HHHHH | | | JJJJJ | RRRRR | TTTTT | | | |
| CORRUGATED IRON AND CONCRETE WITH DOUBLE FLOORING FIRE PROOF  | | .13 | 13 | | | | .13 | | | | | |
| | | | NOTE. DOES NOT STATE WHETHER FOR FLOOR OR CEILING. ASSUMED TO BE FOR FLOOR. | | | | | | | | | |

## FLOORS

| | Thickness T | Used by U. of Pa. A | German Gov.(Wolff) B | B.F. Sturtevant Cats. 84 & 215 (A.R. Wolff) F | Thompson H | Greene I | Allen N | Hoffman O | Tweed Q | Practical Bhg. S | American Rad. Co. T | Donnelly X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fire Proof Tile, Wood Flooring, Concrete Cinder Fill, Metal Lath, Plaster, Girders | | | .124 | .122 | | .29 | .124 | .10 | .10 | .2 | .124 | |
| | 9" | .15 | | | | | Given as fire proof floor with wood flooring | | | | Given mostly as fire proof floorings | |
| | 12" | .10 | | | | | | | | | | |
| | 15" | .06 | | | | | | | | | | |
| Concrete Cinder Fill, Wood Sleepers, Double Floor, Metal Lath, Plaster, Reinforcing Metal, T Beams, Concrete | | AA | | FF | | II | NN | OO | | | TT | XX |
| | | .15 | .124 | .122 | | .025 | .124 | .10 | | | .124 | .428 |
| | | | | | | .25? | | | | | | Concrete with cinder fill |
| | | AAA | | | | | | | | | | |
| Wood Sleepers, Single Flooring, Concrete, Brick Arch, I Beam, Wood Floor | | AAAA | | | | IIII | | | | | | |
| | | .10 | | | | .25 | | | | | | |
| Vault Light, Glass, Iron or Cement | | AAAAA | | FFFFF | | | | | | | | |
| | | 1.43 | | 1.43 | | | | | | | | |

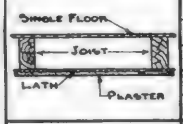
## CEILINGS

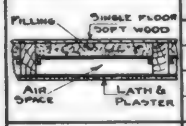
| | Thickness T | Used by U. of Pa. A | German Gov. (Wolff) B | Kinealy D | B.F. Sturtevant Co. Cats. 84 & 215 (Wolff) F | Thompson Ho | Greene 1915 I | Snow K | Allen N | Hoffman O | Tweed Q | Nat. Dist. Heat. Assoc. R | Aper Rad. Co. T | H&V Magazine 1917 U | Hauss Gen. Practice Y | Austrian Gov (Macon) 6 | Donnelly X | Irwin N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wooden Beams Planked over as Ceiling | | .30 | .104 | | .104 | | | | .104 | .35 | | | | | | | | |
| | | | | | Probably applied to usual wood floor of joists and boards | | | | | | | | | | | | | |
| Mill Construction, 6' Stofloor, 3" Plank, Wood Girders 12" Hi | | AA | | | | | II | | | | | | | | | | XX | |
| | | .19 | | | | | .16 | | | | | .19 | | | | | .214 | |
| | | | | | | | | | | | | General Mill Construction | | | | | | |
| Single Floor above No Plaster Below | | AAA | BBB | | FFF | | III | | | | | RRR | TTT | | YYY | GGG | | ZZZ |
| | | 40 | .104 | | .104 | | .33 | | | | | .40 | .104 | | .10 | .33 | | .10 |
| | | | Under as Single Floor Construction Plus Plaster Applied to the Under Wood Floor or Joists and Boards | | | | | | | | | | | | | | | |
| Double Flooring | | AAAA | | | | | IIII. | | | | | | | | | | | |
| | | .23 | | | | | .23 | | | | | | | | | | | |
| Lath & Plaster No Floor Above, Joists, Plaster, Lath | | AAAAA | | DDDDD | | HHHHH | | MMMMM | | OOOOO | QQQQQ | RRRRR | | WWWWW | | | XXXXX | |
| | | .45 | Under as Single Floor Construction Plus Plaster Applied to the Under Wood Floor or Joists and Boards | .62 | Plastered Ceiling Under Wood Floor Joists | .92 | Assuming the attic temperature at 30° above the lowest outside temperature | .257 | | .62 | .50 | .43 | | .62 | | | .60 | |

1- Buffalo Forge Co. makes no distinction between floors and ceilings ∪ See Floors

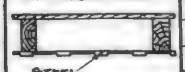
## CEILINGS

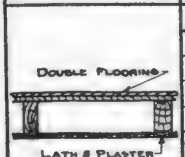
LATH & PLASTER WITH SINGLE FLOOR ABOVE



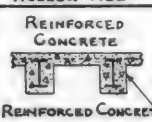
STEEL CEILING WITH FLOOR ABOVE

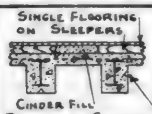



| Thickness | Used by U of Pa. A | Austrian Gov. (Macon) | Thompson | Greene 1913 | Hoffman O | Tweed Q | Nat. Dist. Heat. Assn. R | Donnelly X |
|---|---|---|---|---|---|---|---|---|
| | .28 | | .26 | .19 | .25 | .25 | .28 | 45 |
| | AA | GO | Assuming temperature of attic as 30°F above lowest outside temperature | | | | RR | |
| | .10 | .10 | | | | | .10 | |
| | AAA | | | | | | RRR | |
| | .29 | | | | | | .29 | |
| | AAAA | | | | 0000 | QQQQ | RRRR | |
| | .35 | | | | .35 | .35 | .35 | |
| | AAAAA | | | IIIII | | | | |
| | .25 | | | .16 | | | | |

## CEILINGS FIREPROOF HOLLOW TILE



| Thickness | Used by U. of P. A | German Gov. (Wolfe) B | B.F. Sturtevant Cats 84 & 215 (Wolfe) F | Austrian Gov. (Macon) G | Thompson He | Greene I | Allen N | Hoffman O | Harding P | Tweed Q | Nat. Dist. Heat. Assn. R | American Rad. Co. T | Practical Eng. S | H. & V. Magazine W | Donnelly X |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | .39 | | | | .39 | | | | | .40 | .37 | | | | |
| | AA | | | | HHe | | | 00 | | QQ | RR | | | | |
| | .18 | | | | .10 | | | .14 | | .15 | .18 | | | | |
| | AAA | BBB | FFF | | HHHe | III | NNN | 000 | | QQQ | | TTT | | WWW | |
| | .15 | .145 | .145 | As 30°F above lowest outside temperature | .15 | .14 | .145 | .14 | | .15 | | .145 | | .20 | |
| | | Given as fireproof construction if floored over | | | | | Given as fireproof construction | | | | | Given as fireproof ceiling | | Fireproof floor as ceiling | |
| | AAAA | | | | HHHHe | | | | | QQQQ | RRRR | | | | |
| | .39 | | | | .39 | | | | | .40 | .37 | | | | |
| | AAAAA | | | | HHHHHe | | | 00000 | | QQQQQ | RRRRR | | | | XXXXX |
| | .26 | Given as | | | .10 | | Given merely as fireproof | .14 | | .15 | .18 | | | | .428 |
| | AAAAAA | BBBBBB | FFFFFF | Assuming temperature of attic above the lowest | HHHHHH | III | NNNNNN | 000 | | QQQ | RRR | TTT | | | |
| | .19 | .145 | .145 | | .15 | .15 | .145 | .14 | | .15 | | 145 | | | |
| | | | | | | | | | | | | Given as fireproof ceiling | | | |

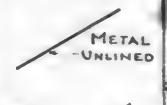
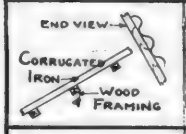
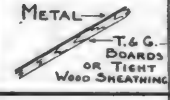
## CEILINGS

| Thickness | Used by U. of Pa. A | German Gov. (Wolff) B | D.F. Sturtevant Cats 84 & 215 (A.R. Wolff) F | Austrian Gov. (Macon) G | Thompson Ho | Greene I | Allen N | Hoffman O | Tweed Q | Nat. Dist. Heat. Asso R | Practical Eng. S | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Double Flooring on Sleepers — Reinforced Concrete | | .24 | | | .24 | | | | | | .24 | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Double Flooring on Sleepers — Plaster on Expanded Metal Reinforced Concrete | | AA | | FF | GG | | II | | | | RR | | | | |
| | With Airspace | .19 | | 1.45 | .187 | | .15 | | | | .19 | | | | |
| | Wit | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Double Flooring — Tile or Concrete Filling — Plaster on Expanded Metal Reinforced Concrete | "T" | AAA | | | GGG | | | | | | RRR | | | | |
| | 6" | .16 | | | .16 | | | | | | .16 | | | | |
| | 7" | .14 | | | .14 | | | | | | | | | | |
| | 8" | .12 | | | .12 | | | | | | .12 | | | | |
| | 9" | .11 | | | .11 | | | | | | | | | | |
| | 10" | .10 | | | .10 | | | | | | .10 | | | | |
| | 12" | .09 | | | .09 | | | | | | | | | | |
| | 15" | .08 | | | .08 | | | | | | .08 | | | | |
| | 20" | .07 | | | .07 | | | | | | | | | | |
| Glass — Iron or Cement Vault Light | | AAAA | | FFFF | | | | | | | RRRR | SSSS | | | |
| | | 1.43 | | 1.43 | | | | | | | 1.46 | 1.4 | | | |
| | | | | | | | | | | | Given for Sidewalk | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

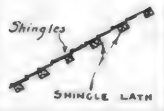
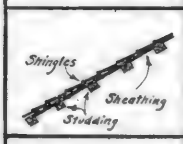
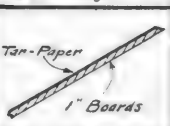
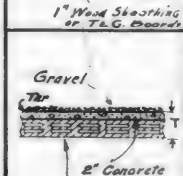
## ROOFS

| Thickness T | Used by U of Pa. A. | German Gov. B. | Austrian Gov. (Macon) G. | Thompson Ho | Greene I. | Buffalo Forge Co. J. | Hubbard L. | Tweed Q. | Nat. Dist. Heat. Asso. R. | Pract. Eng. S. | Amer. Rad. Co. T. | Donnelly. X. | Harrison Z | H. & V. Magazine | Irwin N | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cinder fill — Concrete | 2½" | .80 | | | | .80 | | | .80 | | 2 Given | | | | | |
| | 4" | .60 | | | .60 | | .60 | .60 | .80 | | Cement Roof | | | .60 | | |
| | 6" | .53 | | | .54 | | .54 | .54 | .50 | .54 | | | | .54 | | |
| | Thickness not given | | | | | | | | | | .60 | 428 | | With Tar & Gravel Cement | | |
| | | | | | | | | | | | | | | | | |
| Wood Sheathing — Tiling 3"-1" | | AA | | GG | HHo | | JJ | | | RR | | TT | | MM | WW | ZZ |
| | 3"-1" | .80 | | | .80 | | .80 | | | .80 | | | | | .80 | 1.0 |
| | | | | | | | | | | | | | | Tile Roof | | |
| Tiling — No Boards Under | | | | | | | | | | | | | | | | |
| | No Boards Under | 1.12 | | .99 | | | | | | 1.12 | | 1.25 | | 1.0 | | Tiling with 4" Framing |
| Book or Government Tile — Wood Ceiling | | AAA | | | | III | | | | RRR | | | | | | |
| | 2½-3" | .25 | | | | | | | | .25 | | | | | | |
| | Book Tile | .25 | | | | .25 | | | | | | | | | | |
| | Gov't Tile | .35 | | | | .35 | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

## ROOFS

| | THICKNESS T | USED BY U. OF PA. A. | AUSTRIAN GOV. MACON G. | THOMPSON Ha | BUFFALO FORGE J | HUBBARD L | HARRISON M | TWEED Q | NAT'L. DIST. HTG. ASSO. R | PRACT. ENG. S | AMER. RAD. CO. T | DONNELLY X | H. & V. MAGAZINE W | IRWIN Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|   | UNLINED METAL | 1.30 | | 1.30 | | 1.30 | | | 1.26 | | | | 1.30 | |
| | IRON | 1.30 | | 1.32 | 1.20 GIVEN AS SHEET IRON | | | 1.20 GIVEN AS SHEET IRON | GIVEN AS SHEET IRON | | | | | |
|   | | AA | GG | | JJ | | MM | QQ | RR | | | | | ZZ |
| | | 1.87 | 2.13 | | 1.5 | | 2.14 | 1.5 | 1.81 | | | | | 2.14 WITH 4" FRAMING |
|   | | AAA | GGG | Hasb | | LLL | MMM | | RRR | | TTT | XXX | WWW | ZZZ |
| | IRON | .28 | | .17 | | .17 | | | .28 | | .17 | | .17 | |
| | COPPER OR ZINC | .45 | .44 | | | | .45 | | .44 | | | | | .45 COPPER ON 1" BOARDS |
| | TIN | .31 | | | | | | | | | | .314 | | |
| | | AAAA | | HHHHa | JJJJ | | | | RRRR | SSSS | | | WWWW | |
| | | .88 | | .80 | .85 | | | | .83 | 1.1 | | | .80 | |
| | | | | HHHHb .82 | | | | | | | | | | |
| | | AAAA | GGGG | HHHHa | JJJJ | LLLLL | MMMM | GGGG | RRRR | | TTTTT | XXXXX | WW WWW | ZZ ZZZ |
| | | .38 | .43 | .30 TIGHT WOOD SHEATHING | .43 ON 1" BOARDS | .30 | .45 FOR COPPER ZINC & SLATE | .43 | .39 ON 1" BOARDS | | .30 | .371 | .30 | .43 ON 1" BOARDS |
| | | | | HHHHb 30 | | | | | | | | | | |

## ROOFS

| | THICKNESS T | USED BY U. OF PA. A. | AUSTRIAN GOV. (MACON) G. | THOMPSON H. | GREENE (1913) I. | BUFFALO FORGE CO. J. | HUBBARD L. | HARRISON M. | TWEED Q. | NAT'L. DIST. HTG. ASSO. R. | PRACT. ENG S. | AMER. RAD. CO. T. | DONNELLY X. | H. & V. MAGAZINE W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|   | | .63 | | | .42 | | | | | .58 | .90 | | | |
|   | | AA | | | JJ | | | | | RR | | | XX | |
| | | .32 | | | .31 | | | | | .34 | | | .296 | |
|   | | AAA | GGG | | | | | | | RRR | | | | |
| | | .44 | .436 | | | | | | | .44 | | | | |
| | | AAAA | GGGG | HHHH c | | JJJJ | | MMMM | | RRRR | | TTTT | XXXX | WWWW |
| | 1" BOARDS | .30 | | .30 | | .30 | | .27 | | .30 | | .30 GIVEN AS COMPOSITION ROOF | .286 | .30 |
| | 2" BOARDS | .26 | | | | .26 | | GIVEN AS ASPHALT ROOF | | .26 | | | | |
| | MILL TAR GRAVEL | .21 | | | | | | | | | | | .21 | |
|   | | AAAAA | | HHHHH c | | JJJJJ | LLLLL | | | RRRRR | | | | WW WWW |
| | 8" | .38 | | .40 | | .35 | .36 | | | .40 | | | | .36 |
| | 10" | .36 | | .36 | | | | | | .35 | | | | |
| | 6" TILE 1" CONCRETE | .40 | | | | | .40 | | | | | | | .40 |

## Roofs

| | Thickness | Used by U. of Pa. A | German Gov. (Wolff) B | Peglet Carpenter E | Austrian Gov. (Macon) G | Thompson H | Greene I | Buffalo Forge Co. J | Hubbard F | Harrison M | Tweed Q | Nat. Dist. Htg. Asso. R | Pract. Eng. S | American Rad. Co. T | Harding P | Irwin N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Concrete, Reinforcing, Channel Beams | | .50 | | | | | | | | | | | | | | |
| Cement, Concrete, I Beams, Reinforcing | | AA | | | GG | | II | | | | QQ | RR | | | | |
| | | .50 | | | .57 | | .42 | | | | .43 | .57 | | | | |
| Asphalt, Tar, Pitch & Felt Layers, I Beams, Concrete, Reinforcing | | AAA | | | Original gives varying values from .120 for 65° slope, U=.48 span to .502 for 21° slope. Extend to .282 for 5° slope. | | | | | MMM | | | | | PPP | ZZZ |
| | | .38 | | | | | | | | .27 Asphalt Roof | | | | | .60 3" Concrete 3 Felt, Asph. ½" Slag | .27 Asphalt Roof |
| Asphalt & Gravel Covering, Reinforcing, Concrete, I Beam, Air Space, Metal Lath and Plaster | | AAAA | | | GGGG | | | | | | | RRRR | | | | |
| | | .20 | | | .20 Roof as shown as horizontal | | | | | | | .20 | | | | |
| Cement Concrete, Reinforcing, I Beams, Metal Lath & Plaster Ceiling hung from Beams. | | AAAAA | | | | | IIIII | | | | | | | | | |
| | | .22 | | | | | .22 | | | | | | | | | |

## Ceilings

| | Thickness | Used at U. of Pa. A | Reichnagle & Reitschel C | Austrian Gov. G | Greene I | Thompson H | Buffalo Forge J | Tweed Q | Nat. Dist. Heat Asso. R | Hauss Y | Irwin N |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Double Flooring, Filling, Air Space, Lath & Plaster | | .09 | | .088 | | | | | .09 | | |
| Single Flooring and Double Flooring, Lath & Plaster | | AA | CC | GG | | | JJ | | | | |
| | | | Single Flooring | | | | | | | | |
| | | .10 | 10 | .10 | | | .10 | | | | |
| | | | Double Flooring | | | | | | | | |
| | | .09 | .09 | | | | .09 | | | | |
| Fireproof Ceiling, Angle Support, Metal Lath, Channel Irons, Plaster | | AAA | | | | HHHa | | QQQRRR | | | |
| | | .49 | | | | .19 | .50 | .49 | | | |
| Arch with Sleepers and Single Flooring | | AAAA | CCCC | | IIII | | | | | YYYY | ZZZZ |
| | | .14 | .15 | | .25 | | | | | .14 | .14 |
| | | | | | | | | | | Arch Space | |
| | | | | | | | | | | Given in with Air Space | |
| Brick Arch with Sleepers & Double Flooring | | AAAA | CCCC | | | | | | | | |
| | | .12 | .12 | | | | | | | | |

HHHa – Assuming temperature of attic as 30° F. above lowest outside temperate.

CHICAGO COMMISSION ON VENTILATION

# TEST OF CHICAGO AND COOK COUNTY SCHOOL FOR BOYS

EDITED BY MEYER J. STURM.

II.

*(Concluded from December issue.)*

The other school tests so far reported were based on buildings occupied up to their reasonable capacity and the amount of air handled was fairly constant, regardless of outside conditions.

At the Chicago and Cook County School for Boys, however, there were available only about twenty people, and these had to be moved from room to room, as tests were made, so that simultaneous studies of anything but air movements were impracticable.

The wind cannot be expected to blow from all points of the compass at once, and as the wind pressure seems to be a factor of vital importance with this system, we can only tell what happens when the tested room is to windward or to leeward, such conditions clearly being temporary and of no especial average or continued significance.

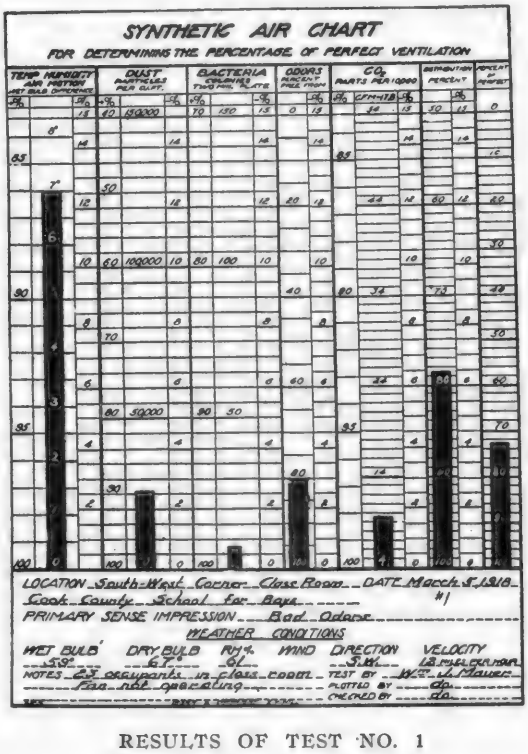
It was impossible even to secure operation of the plant as it was obviously intended to be operated, since, owing to the combined vent flues and their negative action under certain wind conditions, it had been necessary to close off the vent flues entirely from two second-floor rooms.

The engineer testified that it was necessary in very cold weather, say zero, to close entirely the fresh air inlets in order to warm the rooms.

The outlet through the roof is so designed that with a twelve-miles-per-hour wind approximately at right angles to its axis, there is a downward air movement of considerable volume over about one-half of its area even while the fan is in operation.

TEST NO. 1, MARCH 5, 1918.

Attention is called to the fact that the exhaust fan was not in operation. Since the control of air volume and temperature was manual and the room


SYNTHETIC AIR CHART
FOR DETERMINING THE PERCENTAGE OF PERFECT VENTILATION
LOCATION South-West Corner Class Room DATE March 5, 1918
Cook County School for Boys
PRIMARY SENSE IMPRESSION Bad Odors
WEATHER CONDITIONS
WET BULB 59° DRY BULB 67° RH% 61 WIND DIRECTION S.W. VELOCITY 12 miles/hour
NOTES 23 occupants in class room. Fan not operating.
TEST BY W. J. Mauer
PLOTTED BY do.
CHECKED BY do.

RESULTS OF TEST NO. 1

was to windward, the conditions shown are probably the best that could be expected for a gravity direct and indirect system. The impression is decidedly unfavorable.

When the fan was operated merely as an experiment, following the observations recorded, the volume of air exhausted was increased to 1100 cu. ft. per minute, but the amount of air supplied through the three inlets remained in excess of the amount removed. It was difficult to measure correctly by anemometer the velocity of the incoming air, owing to the shape of the inlets.

The room referred to in this test was on the first floor, facing southwest, or to the windward. At the same time, in the northeast, or leeward first floor room the exhaust showed no air movement and of the three fresh air inlets two were neutral, while the third indicated a very slight inward movement.

TEST NO. 2, MARCH 6, 1918.

This is the same room under the same general conditions as the test of March 5, but with the fan in operation, and with the room to leeward. There were eddies around the building, however, which simulated the effect of a west wind to the extent that a west inlet supplied 50% more air than a similar south inlet.

It appears from the chart that the distribution of the fresh air in the room was very poor, short circuits being in effect, while the volume of air moved was surprisingly small.

The following observations were made in the other rooms of the building (all exhausts from rooms being open during the entire test).

TEST DATA #1

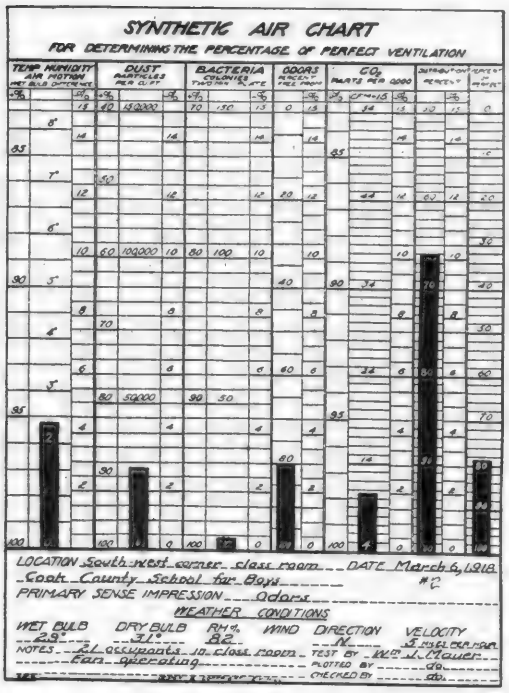
BUILDING Cook County School — DATE March 5, 1918
ROOM S.W. Corner FLOOR 1 — TIME 1:30 P.M. to 2:15 P.M.

| STATION | TEMPERATURE DRY BULB | TEMPERATURE WET BULB | R.H.% | AIR MOTION | DUST | BACTERIA | ODORS | $CO_2$ | SUPPLY REGISTERS AREA ☐ | SUPPLY REGISTERS VELOCITY | SUPPLY REGISTERS C.F.M. | EXHAUST REGISTERS AREA ☐ | EXHAUST REGISTERS VELOCITY | EXHAUST REGISTERS C.F.M. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 76.5 | 63.5 | 50 | 10 | 47,000 | 17 | 80 | 10.9 | 1.12 | 180 | 200 | 3.3 | 142 | 470 |
| 2 | 76.5 | 63.5 | 50 | 10 | 33,000 | 14 | 80 | 7.9 | 1.12 | 180 | 200 | | | |
| 3 | 76.5 | 63.5 | 50 | 10 | 18,700 | 5 | 80 | 7.1 | 1.12 | 180 | 200 | | | |
| 4 | 78 | 63 | 44 | 10 | 14,200 | 3 | 80 | 11.8 | | | | | | |
| 5 | 78 | 63 | 44 | 10 | 18,700 | 9 | 80 | 7.8 | | | | | | |
| 6 | 78 | 63 | 44 | 10 | 23,400 | 1 | 80 | 12.4 | | | | | | |
| AVE. 7 | 77.2 | 63.3 | 47 | 10 | 25,800 | 8 | 80 | 9.6 | | | 600 | | | 470 |
| 8 | | | | | | | | | | | | | | |
| EXM. 9 | 76.5 | 63.5 | 50 | | 94,500 | | | 6.5 | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |

PRIMARY SENSE IMPRESSION. Bad Odors NOTES. Fan not operating. Station 1 - N.E. Corner, 2 = East, 3 = S.E. Cor., 4 = S.W. Cor., 5 = West, 6 = N.W. Cor. Door = Sta. 1, Exhaust = Sta. 2, Windows = 3, 4, 5.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| NO. OCCUPANTS | 23 | WINDOWS NO. | 3 | RADIATORS TYPE | SQ. FT. | WEATHER. Clear - Sunny |
| PHYSICAL STATE | Rest | TYPE Vertical sliding sash | | | | TEMP. DRY 67° WET 59° RM. 61 |
| AIR SPACE PER OCCUPANT | 550 | AREA | 280 ☐ | 41 Sections of | | WIND. DIR. S.W. VEL. 12 M.P.H. |
| TOTAL AIR SUPPLY BY $CO_2$ | 410 | LEAKAGE | Slight | Cast Iron Wall rad. | | CHICAGO COMMISSION ON VENTILATION |
| AIR SUPPLY PER OCCUPANT BY $CO_2$ | 17.8 | RATIO TO $CO_2$ CONTENT | 4/5 | Direct - Indirect | | TEST BY W^m J. Mayer |
| " " FAN | 20.4 | FLOOR AREA PER PERSON | 38 ☐ | 3 units of 2 parts | | PLOTTED BY do. |
| DISTRIBUTION % | 78.5 | | | Total - 369 ☐ | | CHECKED BY do. |
| | | | | | | DRAWING NO. J.W. 6 |

DATA OF TEST NO. 1.


SYNTHETIC AIR CHART
FOR DETERMINING THE PERCENTAGE OF PERFECT VENTILATION
TEMP. HUMIDITY AIR MOTION
DUST PARTICLES PER CU. FT.
BACTERIA COLONIES
ODORS
CO2 PARTS PER 1000
DISTRIBUTION PERFECT
EFFECT OF MOTION
LOCATION South west corner class room DATE March 6, 1918
Cook County School for Boys #2
PRIMARY SENSE IMPRESSION Odors
WEATHER CONDITIONS
WET BULB 29° DRY BULB 31° RH% 82 WIND DIRECTION N VELOCITY 5 MILES PER HR.
NOTES 21 occupants 10 class room TEST BY Wm J. Mauer
Fan operating PLOTTED BY do.
CHECKED BY do.

RESULTS OF TEST NO. 2.

| Room | Size of Exhaust Square Feet | Velocity Ft. per min. | Volume C. F. M. |
|---|---|---|---|
| First Floor | | | |
| N. E. Corner | 3.3 | 310 | 1025 |
| Office—N. | 2.6 | 265 | 690 |
| Chapel—N. | 3.3 | 260 | 860 |
| N. W. Corner | 3.3 | 240 | 790 |
| S. W. Corner | 3.3 | 280 | 925 |
| Store room—S. | 3.3 | 270 | 890 |
| S. E. Corner | 3.3 | 270 | 890 |
| | | | 6070 |
| Second Floor | | | |
| N. E. Corner | 3.3 | 220 | 725 |
| N. W. Corner | 3.3 | 220 | 725 |
| S. W. Corner | 3.3 | 200 | 600 |
| S. E. Corner | 3.3 | 210 | 695 |
| Gym. E. | 7.5 | 260 | 1950 |
| Gym. NW. | 7.5 | 210 | 1575 |
| Gym. SW. | 7.5 | 210 | 1575 |
| | | | 7905 |
| First Floor | | | 6070 |
| | | | 13975 C. F. M. |

## TEST DATA

BUILDING Cook County School #2 DATE March 6, 1918
ROOM S.W. Corner FLOOR 1 TIME 1:30 P.M. to 2:30 P.M.

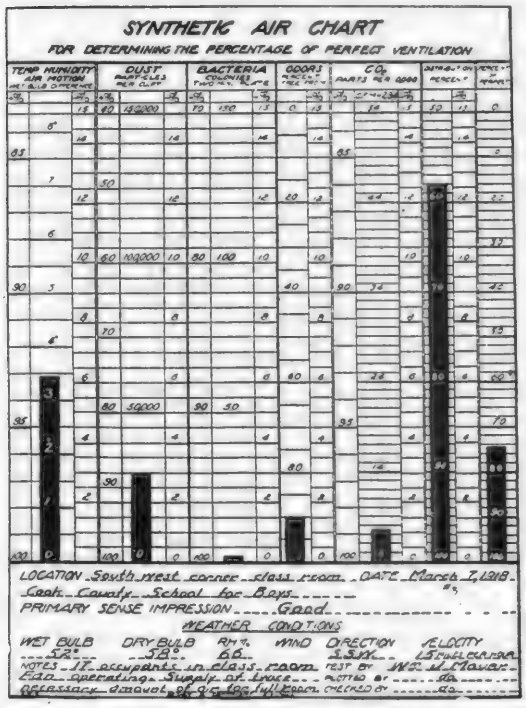
| STATION | TEMPERATURE DRY BULB | TEMPERATURE WET BULB | RH% | AIR MOTION | DUST | BACTERIA | ODORS | $CO_2$ | SUPPLY REGISTERS AREA ☐ | SUPPLY REGISTERS VELOCITY | SUPPLY REGISTERS C.F.M. | EXHAUST REGISTERS AREA ☐ | EXHAUST REGISTERS VELOCITY | EXHAUST REGISTERS C.F.M. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 72 | 54 | 27 | 10 | 47,000 | 1 | 80 | 8.2 | 1.12 | 265 | 293 | 3.3 | 280 | 925 |
| 2 | 72 | 54 | 27 | 10 | 18,700 | 2 | 80 | 7.0 | 1.12 | 265 | 293 | | | |
| 3 | 72 | 54 | 27 | 10 | 42,500 | 12 | 80 | 15.9 | 1.12 | 265 | 293 | | | |
| 4 | 72 | 54 | 27 | 10 | 23,400 | 2 | 80 | 7.9 | | | | | | |
| 5 | 72 | 54 | 27 | 10 | 18,700 | 1 | 80 | 8.4 | | | | | | |
| 6 | 72 | 54 | 27 | 10 | 16,400 | 6 | 80 | 16.0 | | | | | | |
| AVE. 7 | 72 | 54 | 27 | 10 | 27,800 | 4 | 80 | 10.6 | | | 880 | | | 925 |
| 8 | | | | | | | | | | | | | | |
| EXH. 9 | 72 | 55 | 31 | | 49,000 | | | 6.7 | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |

PRIMARY SENSE IMPRESSION. Odors NOTES. Fan operating at 280 r.p.m

Station 1 = NE. Cor., 2 = East, 3 = S.E. Cor., 4 = S.W. Cor., 5 = West., 6 = N.W. Cor., Door = Sta. 1, Exh. Sta. 2, Windows 3,4,5

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| NO. OCCUPANTS 18 Boys, 2 men, 1 women | 21 | WINDOWS NO. | 3 | RADIATORS TYPE | RADIATORS SQ. FT. | WEATHER: Snow | |
| PHYSICAL STATE | Rest | TYPE Vertical sliding sash | | | | TEMP. DRY. 31° WET. 29° RH% 82 | |
| AIR SPACE PER OCCUPANT | 605 | AREA | 280 ☐ | 41 Sections of | | WIND. DIR. N. VEL. 5 M. P. H. | |
| TOTAL AIR SUPPLY BY $CO_2$ | 318 | LEAKAGE | Slight | Cast Iron | Wall rad. | CHICAGO COMMISSION ON VENTILATION | |
| AIR SUPPLY PER OCCUPANT BY $CO_2$ | 15 | RATIO TO $CO_2$ CONTENT | 1/5 | Direct- | Indirect | TEST BY Wm J. Mauer | |
| . . . . . FAN | 44.0 | FLOOR AREA PER PERSON | 42 ☐ | 3 units of | 2 parts | PLOTTED BY do. | |
| AIR DISTRIBUTION % | 66.0 | | | Total = | 369 ☐ | CHECKED BY do. | |
| | | | | | | DRAWING BY J.W.T | |

DATA OF TEST NO. 2.


SYNTHETIC AIR CHART
FOR DETERMINING THE PERCENTAGE OF PERFECT VENTILATION
LOCATION South west corner class room DATE March 7, 1918.
Cook County School for Boys
PRIMARY SENSE IMPRESSION Good
WEATHER CONDITIONS
WET BULB 52° DRY BULB 58° RH% 66 WIND DIRECTION S.S.W. VELOCITY 15 miles per hour
NOTES 17 occupants in class room. TEST BY Wm. J. Mayer
Fan operating. Supply at floor PLOTTED BY do.
Percentage removal of CO2 for 1/4 hour CHECKED BY do.

RESULTS OF TEST NO. 3.

When a window was opened in a windward room, naturally, a large volume of air entered at once, and tests showed that this short circuit supply to the fan caused a corresponding immediate reduction in the air removed from the other rooms, particularly in the room on the same vent flue as that in which the window was opened.

TEST NO. 3, MARCH 7, 1918.

This is the same room as before, with the fan running and with a high wind from the southwest, so that the room was to windward. One-half of the radiators in each set were unheated.

The volume of air handled was very much greater, due to the wind, and due also, apparently, to less resistance or current fluctuations the fan was running faster, though it has a constant speed motor. Yet the distribution as per carbon dioxide observations at least, was very uneven.

## TEST DATA #3

BUILDING Cook County School
ROOM S.W. Corner FLOOR 1
DATE March 7, 1918
TIME 1:30 P.M. TO 2:15 P.M.

| STATION | TEMPERATURE DRY BULB | TEMPERATURE WET BULB | RH% | AIR MOTION | DUST | BACTERIA | ODORS | $CO_2$ | SUPPLY REGISTERS AREA ☐" | SUPPLY REGISTERS VELOCITY | SUPPLY REGISTERS C.F.M. | EXHAUST REGISTERS AREA ☐" | EXHAUST REGISTERS VELOCITY | EXHAUST REGISTERS C.F.M. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 74 | 53 | 21 | 10 | 45000 | 8 | 90 | 14.0 | 1.12 | 600 | 673 | 3.3 | 450 | 1485 |
| 2 | 74 | 53 | 21 | 10 | 38000 | 2 | 90 | 4.5 | 1.12 | 600 | 673 | | | |
| 3 | 74 | 53 | 21 | 10 | 32000 | 1 | 90 | 4.5 | 1.12 | 600 | 673 | | | |
| 4 | 74 | 53 | 21 | 10 | 25000 | 0 | 90 | 3.8 | | | | | | |
| 5 | 74 | 53 | 21 | 10 | 20000 | 0 | 90 | 7.5 | | | | | | |
| 6 | 74 | 53 | 21 | 10 | 20000 | 0 | 90 | 9.9 | | | | | | |
| AVE. 7 | 74 | 53 | 21 | 10 | 30000 | 2 | 90 | 7.4 | | | 2020 | | | 1485 |
| 8 | | | | | | | | | | | | | | |
| AVE. 9 | 74 | 53 | 21 | | 39000 | | | 5.5 | | | | | | |
| 10 | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |

PRIMARY SENSE IMPRESSION. Good
NOTES. Fan operating at 308 r.p.m.
Station 1 = NE. Cor., 2 = East, 3 = S.E. Cor., 4 = S.W. Cor., 5 = West, 6 = N.W. Cor., Door at Sta. 1, Exh at 2, Windows 3, 4, 5.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| NO. OCCUPANTS | 14 Boys, 2 men, 1 Woman | 17 | WINDOWS NO. | 3 | RADIATORS | | WEATHER. Sunny |
| PHYSICAL STATE | | Rest | TYPE | Vertical Sliding Sash | TYPE | SQ. FT. | TEMP. DRY 58° WET 52° RH% 66 |
| AIR SPACE PER OCCUPANT | | 750 | AREA | 280 ☐" | 41 sections of | | WIND. DIR. S.S. VEL. 15 M.P.H. |
| TOTAL AIR SUPPLY BY $CO_2$ | | 500 | LEAKAGE | Slight | Cast Iron | Wall mod. | CHICAGO COMMISSION ON VENTILATION |
| AIR SUPPLY PER OCCUPANT BY $CO_2$ | | 29.4 | RATIO TO CU. CONTENT | 1/45 | Direct-Indirect. | | TEST BY Wm. J. Mayer |
| " " " " FAN | | 87.3 | FLOOR AREA PER PERSON | 50 ☐" | 3 units of 2 parts | | PLOTTED BY do. |
| AIR DISTRIBUTION % | | 58.0 | | | Total = | 369 ☐" | APPROVED BY do. |
| | | | | | | | DRAWING NO. J.W.8 |

DATA OF TEST NO. 3.

It is probably safe to say that so large an air supply could not have been tolerated when the outside temperature was much lower than indicated on the day of the experiment.

On March 7 the effect of wind pressure was particularly observed, as shown by Diagrams 1 and 2.

Diagram 1 indicates that with the fan not operating the building as a whole acted as a very loosely built single room would have acted, with leakage in on the windward side, and leakage out on the leeward side. Apparently the connecting ducts in the attic aided in transmitting the pressure to the leeward rooms, for despite the theoretical tendency of the heaters above the fresh air inlets to cause an upward draft the air passed downward through the lee side heaters, and out through the openings under the windows, while the pseudo exhaust flues in the leeward rooms became supply flues.

Diagram 2 shows the same outside conditions as Diagram 1 with the exhaust fan running.

It will be noted that the exhaust registers in some of the rooms, both under the condition of fan not operating and fan operating, were supplying air to the room. A sample of air taken at register No. 3 with fan operating and while air was entering the room showed five parts of $CO_2$. This carbon dioxide content would probably have been much higher if the entire building were occupied by the number of boys for which it was designed.

On the outside of the building at the wall registers a temperature of 85° F. was recorded. This was on the leeward side of the building where the air was exhausting through what was intended as fresh air inlets. The velocity of the wind was great enough to overcome the effect of the fan and the air from the room was passing downward through the radiator enclosures and was warmed by the radiator before passing outside.

To check the foregoing a similar test was made on March 9, when the wind was blowing southeast at a velocity of

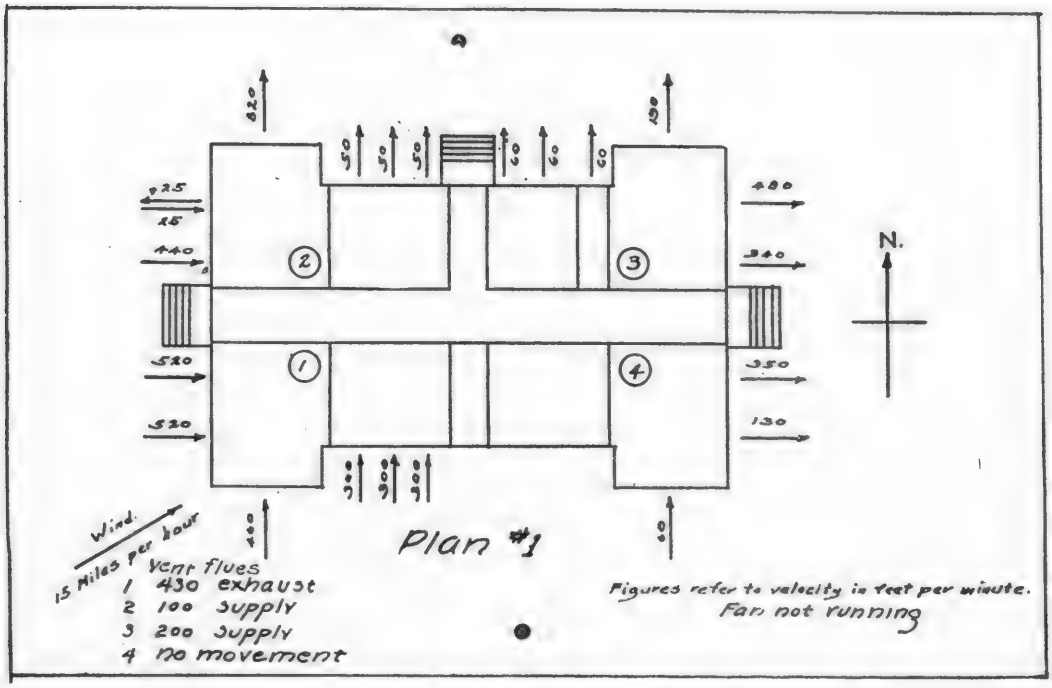



DIAGRAM NO. 1, FAN NOT OPERATING.

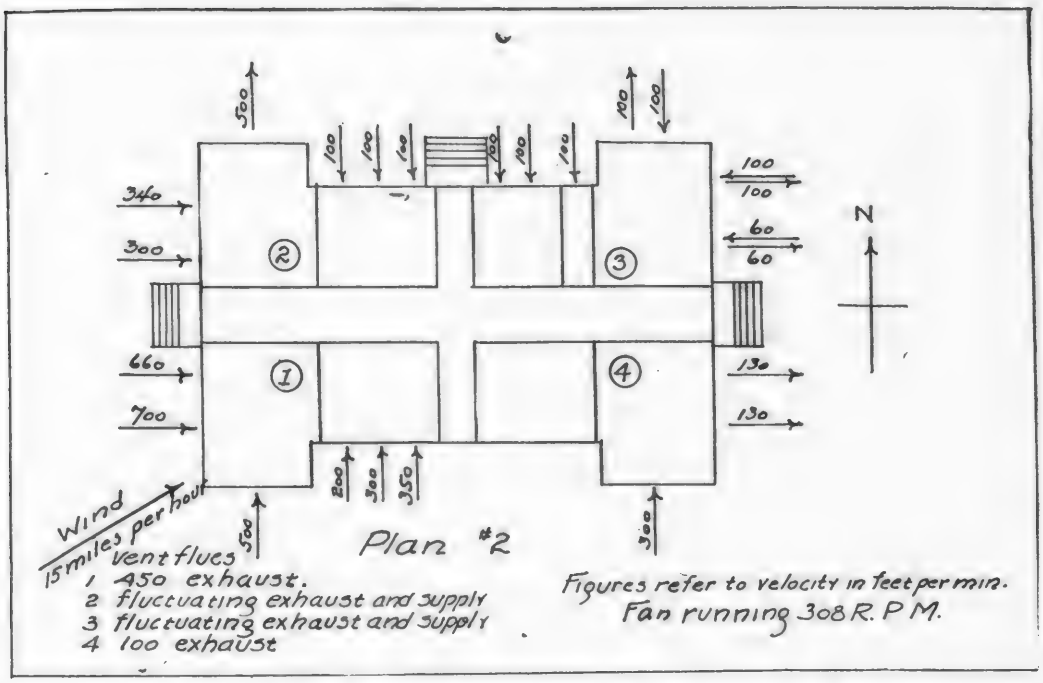



DIAGRAM NO 2, SAME OUTSIDE CONDITIONS, EXHAUST FAN RUNNING.

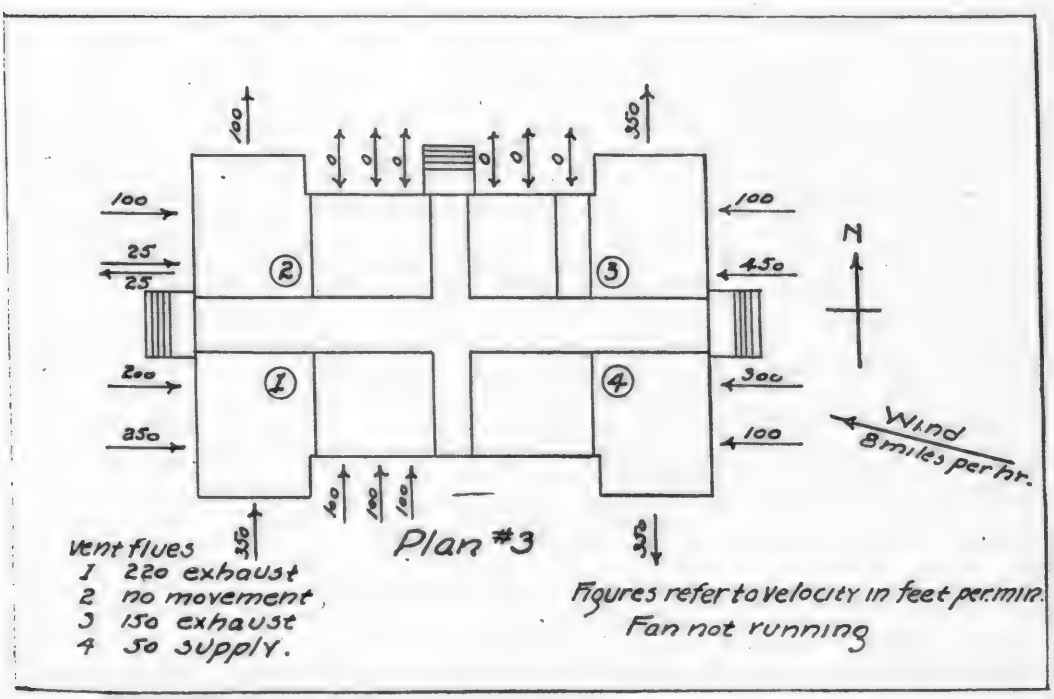



DIAGRAM NO. 3, SHOWING EFFECT OF WIND ON INTAKES, FAN NOT OPERATING.

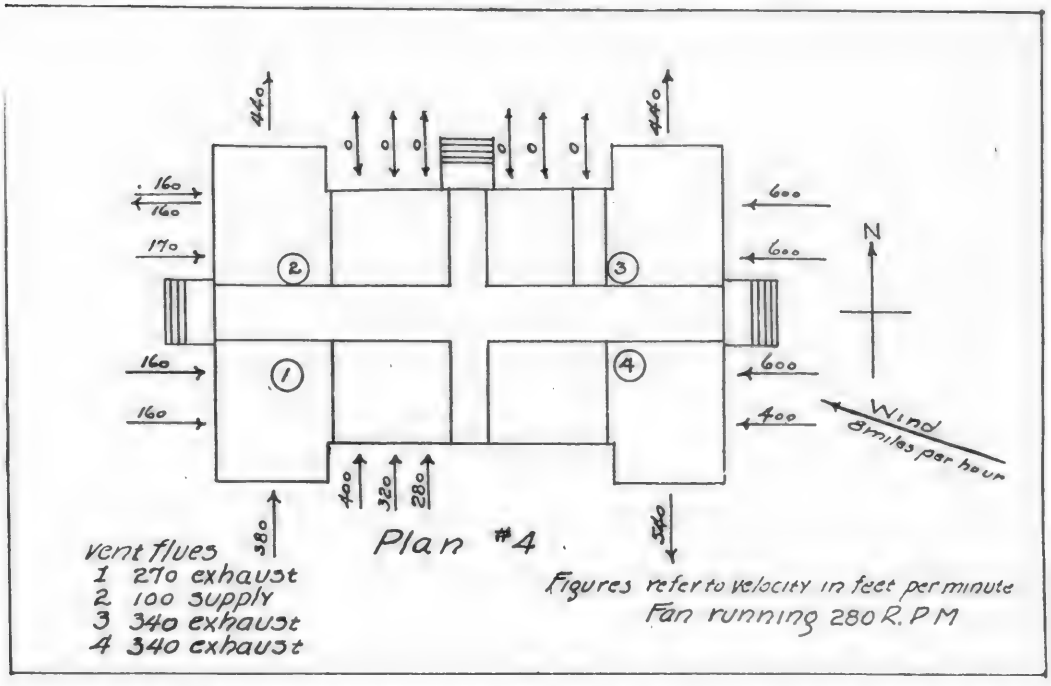



DIAGRAM NO. 4, EFFECT OF WIND ON INTAKES, FAN OPERATING AT 280 R. P. M.

8 miles per hour. Outside temperature was 40.5° dry bulb and 39° F. wet bulb.

Diagram 3 shows the effect of the wind on the intakes at the various sides of the building as in Diagram 1, with *fan not operating.*

Diagram 4 shows the effect of the wind on the intakes at the various sides of the building as in Diagram 2 *with fan operating* at 280 RPM.

The whirling motion of the wind resulting from its sweep around a corner of the building in some instances caused a wind pressure against the leeward side of the building. This should be taken into consideration in an analysis of the above tests.

The wind pressure was lower, so that the results shown in Diagrams 3 and 4 are less pronounced, but are still characteristic and are good testimony in checking Diagrams 1 and 2. Note that in Diagram 4 the same outside pressure and the two east inlets in room 4 caused a current of air outward against the wind through the south inlet.

SUMMARY OF TESTS.

There is no automatic temperature regulation on the plant, and only a very crude method of hand regulation. There is no means of introducing moisture into the air and evidently there is need for such introduction. No matter how air is heated, when heated its moisture content will fail to increase with its expansion in volume.

*Air motion*

To say that the air motion was 10 ft. per minute is only approximate, and applies to certain parts of the room only. The air currents were traced with a powder puff and in some parts of the room, especially the northwest corner, no air motion was detected. The $CO_2$ observations indicate this condition.

*Distribution*

There was better distribution of the fresh air during the first test with the fan *not* in operation than the average of tests 2 and 3 when the fan was operating.

In tests 1 and 3, with a strong southwest wind, the air motion was toward the door in the northeast corner, causing strong outward draft through the cracks. In test 2 with a north wind blowing, a strong current of air was entering under the door in the northeast corner and currents throughout the room were different in velocity and general direction than in either of the other two tests.

*Dust*

The boys work on the farm and attend classes in the school in the same clothing which they wear at work. It is to be expected that considerable dirt will be brought in by the boys and as the floors are not oiled, a high dust count is a natural result.

The tests proved that the air at the door and at the side of the room near the exhaust was heavy with dust, while the sides of the room near the windows were normal. During the tests there was very little movement of the occupants, and the dust count would have been much higher if there had been more physical activity of the occupants.

*Bacteria*

Except at stations 1 and 6 of test 2, the dust and bacteria counts coincide very closely.

The rooms were occupied only five minutes before each test was started. The bacteria dishes were exposed after the pupils were in the room about thirty minutes.

The bacteria count is very high in test 1 when the fan was not operating. In test 2 with the fan operating the count is uniform and low except in the southeast corner, which reading checks very closely, however, with the dust. In test 3 the bacteria showing is very good. With a high velocity S. S. W. wind blowing, the three stations on the window or west side show no bacteria and the southeast corner has but one colony. The air supply from the south and west walls during the test was greater than had been anticipated in the design of the system and the crowding of the foul air toward the door in the northeast corner accounts for the high bacteria at that point.

*Odors*

The boys wore dirty clothing in the class-room, but the high percentage of odors observed indicates poor ventilation.

*Carbon Dioxide*

These observations are the best indications of the lack of distribution, and of the effect that varying outside conditions have on the ventilation of the class-room. With a north wind the air sweeps diagonally through the room from the northeast to the southwest and a high $CO_2$ content is manifest in the northwest and southeast corners. With a south wind the direction of the air currents is from the southwest to the northeast, the reverse of the travel with a north wind blowing.

## CONCLUSIONS.

The tests coincide with those made by the Chicago Commission on Ventilation on window-ventilated buildings, in that the effect of wind is very pronounced, enabling the occupants, if they will, to obtain fresh air in rooms to windward, but causing a lack of fresh air directly from outside, in leeward rooms. It has been found that in order to ventilate properly a building equipped with window ventilation, whether this is a school building or a multi-story manufacturing plant, some of the rooms or floors must be used as intake facilities, and some of them must be used as outlet facilities, while others at this time, remain neutral. The objection to such a system is, of course, that the occupants of the parts which became vent flues and neutral zones are treated unfairly.

This particular direct-indirect plant, under consideration, is especially badly circumstanced in that the flues are

of the trunkline type, ending in a foul-air gathering chamber common to all where there is an inefficient and improperly designed fan, discharging through an impossible roof outlet.

The trunk line outlet permits odors and sounds from adjacent rooms to each other, transmits throughout the building any wind pressures existing on any one side, and permits any change in resistance in a room near the fan to affect materially the volume of air drawn from rooms further down the duct. It is impossible with this system, except on a day when there is absolutely no wind, to achieve anything like a uniform supply of fresh air contemporaneously to all of the rooms. The check dampers possibly would correct the back drafts if they were placed in each branch or inlet, as is the more common and probably better practice. As placed near the gathering chamber they are about useless.

The fan is of a type useful for stirring up air within a room, or for overcoming very slight resistance at a flue base. It will not overcome the resistance of any considerable duct system and as evidenced by these tests is inadequate for the condition. As placed in this building the fan location is objectionable, being inaccessible, liable to cause trouble on account of noise, and for these reasons being likely not to be kept in operable condition. We observe that the unsightly radiator enclosures are very foul both from outside contamination and from a tendency of the occupants to use them as cuspidors. As located the fresh air inlets are particularly favorable centers of distribution for odors and worse conditions. It becomes clear, with an exhaust system of this character that since air is so very elastic great care must be given to the design of the ducts, with volume dampers at each branch, so that the most distant exhaust will get its proper quota. Any change in resistance, such as a window or door open or a register closed, will unbalance the whole scheme. Such unbalancing with a direct-indirect system inherently crudely controlled as to temperature, will cause deficient heating in the room which has the most air, and overheating in the room which has the least air.

# UNITED STATES FUEL ADMINISTRATION

*Articles appearing in this department are published with the endorsement of the United States Fuel Administration at whose request* THE HEATING AND VENTILATING MAGAZINE *is co-operating in a national plan for fuel conservation. It is the fuel administration's desire that we publish in each issue a strong, authoritative article on fuel conservation, regarding the phases of economy which may apply to the heating and ventilating industry. The Fuel Administration is issuing invitations to authors throughout the country to keep editors supplied with desirable conservation articles. Our readers can assist in this work very materially by sending in data and other matter that would be suitable for this department.*

# POSSIBILITIES FOR FUEL SAVING IN EXISTING PLANTS

By A. H. ANDERSON.

The high price of coal has given the operating engineer a chance such as he never had before to show substantial economies in the cost of power generation. Many engineers have established themselves securely in the opinion of their employers by correcting conditions in their plants which had caused waste in fuel. The waste was never serious until the present emergency in the fuel situation, but now even a 1% saving is considerable.

The operating steam engineer is a busy individual whose services are sought by every department of the establishment to which he furnishes heat, light, and power. He must see to keeping everyone comfortable in the cold weather, well supplied with light, and he has the power plant machinery to maintain. He therefore comes in contact with apparatus of the most varied character for which supplies must be purchased in order that efficiency of operation be maintained.

The engineer is responsible for the purchase of coal, oil, packing, pumps, boiler setting repairs, engine and generator repairs, and is expected to give correct advice when it is necessary to purchase new boilers, stokers, engines, or other machinery. He is expected to be familiar with elevators, moving stairs, plumbing and electric fixtures, and whether the boiler blows up or an electric fan burns up, the engineer is the man who is called upon to handle the situation.

### NEW APPARATUS OFTEN A MONEY-SAVING PROPOSITION.

How do engineers respond to such varied demands upon their time and energy? Some few men keep away from trouble until it becomes absolutely necessary to take action. Others are continually on the lookout for places where trouble may be expected and usually prevent accidents by keeping machinery in good repair. Such engineers have had enough initiative to call on the owners for repair parts or new and improved machinery. They have learned that it pays to keep a good supply of repairs on hand for emergencies, and they have also learned

that it pays to scrap old machinery and replace it with more efficient machines.

The progressive engineer whose plant is kept in good condition decides upon a new machine which will save his plant considerable money. Before he presents the matter to his superiors, he studies the machine and is prepared for criticism and questions with data on performances of similar machines in other plants. His superiors may refuse to spend the money, but the progressive engineer answers such an argument by threatening to resign his position, because he cannot properly perform his duties without the desired machines.

Usually this is just the attitude which the superiors wish to see in the engineer, indicating firmness in insisting on what he feels is right.

### IMPORTANCE OF BOILER INSTRUMENTS RECOGNIZED BY FUEL ADMINISTRATION.

Just now the progressive engineer is hard at work in the boiler room where he is training his firemen to work more economically because he realizes that the greatest waste occurs where the coal is burned. Many engineers have been surprised to find how easy it is to make a splendid showing in fuel economy by reducing boiler losses to a minimum. They are installing soot blowers, boiler-water testing outfits, pyrometers, water meters, coal weighers, heat unit testers, calorimeters, and draft instruments, and the engineer and firemen are soon pleased to observe a reduction in the amount of fuel burned and a corresponding reduction in troubles from low steam pressure, leaky tubes and burned out grates. If any engineer was disposed to question the benefit of instruments for his boilers, such doubts are dispelled by the Fuel Administration questionnaire which gave a plant with instruments more standing than the plant without instruments.

### INSTANCES OF IMPROVED BOILER OPERATION.

An instance which actually happened illustrates the point. A new engineer coming on the job was told by his predecessor that he had always had trouble keeping up the steam pressure. A short examination of the boiler showed the damper wide open with holes in the fire and the excess air roaring through the grate. The new engineer climbed up to the damper and attached a wire to it so that it could be adjusted. The damper was pulled to a quarter-open position and in a few minutes the safety valve was popping off—the first time in many months, the fireman said. The fuel saved each day amounted to more than the fireman's wages for a week. The engineer showed the results to his employer, and requested draft instruments by which to correctly adjust his damper, and the employer could not refuse to make the desired purchases in the face of such excellent service.

The new engineer next surveyed the outside of his boiler setting with a lighted candle and found it porous. A request for setting compound resulted in a saving of over 5% in the fuel bill.

Then, an examination of the hand-fired grates showed them to be of such large dimensions that, when coverd with coal, too much heat was generated. In other words, the grate surface was too large for the usual boiler load and the fireman was accustomed to keeping a very thin fire on the grate to prevent the safety valve from popping, which resulted in large bare spots and excess air. The engineer decided to reduce the grate area by removing a few of the back grate bars and reversing them so that the shaking bars would not affect them. A good fire could then be carried on the remainder of the grate, preventing formation of holes. A saving of 10% was the result.

PROGRESSIVE ENGINEERS WIN CONFIDENCE OF EMPLOYERS.

Does any one suppose that any request of such engineers for instruments is ignored by employers? The position of the engineer is rendered most agreeable because of the confidence shown by the employer, but that confidence was earned by the loyal and zealous efforts displayed by the engineer in behalf of his superiors. The progressive engineer who has taken advantage of his opportunity assumes his rightful position in the executive councils of his firm.

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# SUPERVISION OF STEAM POWER PLANTS

## How the Eastman Kodak Company Developed a Suggestion of the United States Fuel Administration.

By C. K. FLINT.

Superintendent Engineering and Maintenance Department, Eastman Kodak Company,

EDITOR'S NOTE.—*The following account of the increased efficiency obtained by following the suggestions of the Fuel Administration has been received in response to the invitation sent out by* THE HEATING AND VENTILATING MAGAZINE *at the Fuel Administration's request.*

Most of the recommendations outlined by the United States Fuel Administration in its "standard questionnaire for steam power plants," have always been in force at the plant of the Eastman Kodak Company. The last recommendation (H) is the one which mostly affected our plant.

Recommendation (H) refers to the subject of supervision and asks specifically:

"Question 1. Has the owner detailed a competent employee to supervise the work of fuel conservation in the boiler and engine plants with directions to report weekly on measures of economy and progress in conservation of fuel?"

"Question 2. Has the owner appointed a man in charge of the work of fuel conservation outside of the boiler and engine rooms described under 'Recommendations'?"

In regard to this recommendation, a General Power Savings Committee consisting of the master mechanic, electrical engineer and testing engineer, has been appointed. In addition to this committee is a sub-committee, consisting of an electrician foreman, pipefitter foreman and the testing engineer, which makes inspections through the plant twice each week and reports to the general committee. The general committee acts in an advisory capacity and meets once a week when all suggestions and recommendations are discussed and passed upon.

In addition to these two committees, each manufacturing department has a committee whose duty it is to make periodical inspections in that department, reporting to the department superintendent. All of these departments co-operate with the general committee but their reports are made separate and distinct from those of the general committee.

As to the results obtained due to these committees, a considerable saving has been made by reducing the size and number of lamps in use; shutting off radiators, motors and ventilating fans when not in use, or when the departments are unoccupied; repairing and shutting off by-passes on steam traps and covering pipes.

In a plant of this size it would be difficult to determine the actual saving made, but we are satisfied that the results more than justify the expense.

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"THE BUSINESS men have made good in this war. The government knows this and business will get a new deal in the coming years." This authoritative message comes from one who is well qualified to speak on the subject and his words have special reference to the attitude heretofore shown by the government toward co-operation and even combinations among business interests and trade organizations.

If the war has demonstrated one thing more than another, it is that co-ordinated effort in the industries, coupled with greater uniformity of processes and standardization in many lines of manufacture, has been an important, nay, an essential factor in the winning of the war. To revert now to the ante-bellum status of sharp competition and the strict application of the Sherman "anti-trust" law would without doubt prove a serious setback to American industry at a time when the long-predicted world commercial war is about to begin.

First on the program for legislative action, then, in the repeal of the Sherman law. With this out of the way and with the years of experience behind us of the abuses possible in business combinations, it ought to be, and it is, possible to construct a law that will give the needed latitude for the promotion of business and the upbuilding on strong commercial lines, of the trade associations.

The thought is well expressed in the resolution passed at the recent War Service Committees' conference. It is as follows and will bear careful reading:

"The experiences of the war have clearly demonstrated the value of national trade organizations and their service to the country, as well as to industry.

"This conference heartily approves the plan of organizing each industry in the country in a representative trade association and expresses the belief that each dealer, jobber, manufacturer and producer of raw materials should be a member of the national organization in his trade and cordially support it in its work."

Men in all lines of manufacture are having serious thoughts in connection with the labor problem. If high wages are to prevail for an indefinite period, there is all the more reason why business should reorganize, or rather perpetuate the best features of its war-time organization, which makes the trade itself the unit, rather than the individual manufacturer.

AS THIS number reaches our readers the last lap will have been reached in the campaign of the heating engineers' society for the raising of funds for its proposed research bureau. It is with the greatest pleasure that we are able to state that the success of the project seems to be assured and that the trade will "go over the top" in an impressive manner.

# RECONSTRUCTION PROGRAMME OUTLINED BY WAR SERVICE COMMITTEES

What is described as a new and powerful federation of American industries was created at the Reconstruction Congress of Industrial War Service Committees which met last month in Atlantic City. This association, made up of nearly 400 war service committees, was created by the committees to act in the future as the spokesman for industry before the government, in the same manner that the committees acted separately as the point of contact between industry and the government during the war period. The federation voted to operate under direction of a committee of the Chamber of Commerce and it will have back of it and serving it the organization of the United States Chamber of Commerce. The chairman of the war service committees will sit as an Industrial Advisory Council to the organization.

The views of this assemblage of industries respecting industrial readjustment were expressed at Atlantic City in a series of resolutions covering the most important subjects that are engaging the attention of business men at the present time.

No less than 32 resolutions were adopted, a number of which were of particular interest to the heating industry. For instance, on the subject of national trade association it was resolved that:

NATIONAL TRADE ASSOCIATIONS.

The experiences of the war have clearly demonstrated the value of National trade organizations and their service to the country as well as to industry.

This conference heartily approves the plan of organizing each industry in the country in a representative national trade association and expresses the belief that every dealer, manufacturer, jobber and producer of raw materials should be a member of the national organization in his trade and cordially support it in its work.

INDUSTRIAL CO-OPERATION

Industrial co-operation was advocated in the following:

The war has demonstrated that through industrial co-operation great economies may be achieved, waste eliminated, and efficiency increased. The nation should not forget, but rather should capitalize, these lessons by adapting effective war practices to peace conditions through permitting reasonable co-operation between units of industry under appropriate federal supervision. It is in the public interest that reasonable trade agreements should be entered into, but the failure of the government either clearly to define the dividing line between those agreements which are, and those which are not, in unreasonable restraint of commerce, or to provide an agency to speak for it on application of those proposing to enter into such agreement, in effect restricts wholesome co-operation and deprives both industry and the general public of its benefits. The conditions incident to the period of readjustment renders it imperative that all obstacles to reasonable co-operation be immediately removed through appropriate legislation.

The Federal Trade Commission was endorsed and urged to continue its activities.

INDUSTRIAL RELATIONS

The new outlook on industrial relations was outlined in the following resolution which was declared to be the most significant of all.

The convention heartily endorses in letter and spirit the principles of the industrial creed so clearly and forcibly stated in the paper by Mr. John D. Rockefeller, Jr., and urges upon all units of industry—where they may not now be employed—the application of such principles. Without approving or rejecting his particular plan or machinery, the principles advanced by Mr. Rockefeller are as follows:

1. Labor and capital are partners, not enemies; their interests are common interests, not opposed, and neither can attain the fullest measure of prosperity at the expense of the other, but only in association with the other.

2. The purpose of industry is quite as much to advance social well-being as material well-being, and in the pursuit of that purpose, the interests of the community should be carefully considered, the well-being of the employees as respects living and working conditions should be fully guarded, management should be adequately recognized and capital should be justly compensated and failure in any of these particulars means loss to all.

3. Every man is entitled to an opportunity to earn a living, to fair wages, to reasonable hours of work and proper working conditions, to a decent home, to the opportunity to play, to learn, to worship, and to love, as well as to toil, and the responsibility rests as heavily upon industry as upon

government or society, to see that these conditions and opportunities prevail.

4. Industry, efficiency and initiative, wherever found, should be encouraged and adequately rewarded, and indolence, indifference and restriction of production should be discountenanced.

5. The provision of adequate means for uncovering grievances and promptly adjusting them, is of fundamental importance to the successful conduct of industry.

6. The most potent measure in bringing about industrial harmony and prosperity is adequate representation of the parties in interest; existing forms of representation should be carefully studied and availed of in so far as they may be found to have merit and are adaptable to the peculiar conditions in the various industries.

7. The application of right principles never fails to affect right relations; the letter killeth and the spirit maketh alive; forms are wholly secondary, while attitude and spirit are all important, and only as the parties in industry are animated by the spirit of fair play, justice to all and brotherhood, will any plans which they may mutually work out succeed.

8. That man renders the greatest social service who so cooperates in the organization of industry as to afford to the largest number of men the greatest opportunity for self-development and the enjoyment by every man of those benefits which his own work adds to the wealth of civilization.

Other resolutions dealt with the following subjects.

To protect public interests as well as commercial interests in the cancellation of war contracts.

To avoid demoralization through the disposition of surplus government supplies.

To free industry from war restrictions.

To encourage the development of pivotal industries not formerly established in this country.

To foster industrial co-operation under appropriate federal supervision.

To provide the appointment of men sympathetic with industrial needs on the Federal Trade Commission.

The induction of war workers and soldiers into industrial life without causing any demoralization with local chambers of commerce aiding.

The development of public works to provide employment for unskilled labor.

That taxation should be made in sympathy with the complex conditions which affect business in securing revenue needed to discharge our obligations.

The provision by the government for a fair valuation on raw material and goods in course of completion or completed on government work on inflated valuations so that taxes may be just without being burdensome.

On the early return of the railroads to private ownership under such federal regulations as will be widely beneficial.

Opposition to government ownership and operation of wires and cables.

Recommending the completion of the construction of a great merchant marine to be operated under American control.

For the development of port and harbor facilities to improve commerce by means of zones discharging at different points.

The study of the question of local transportation, the control of rates, franchises, taxes and similar questions with a view to their extension.

The enaction of legislation to develop hydro-electric power.

To continue allied co-operation for international reconstruction.

The appointment of a commission of American business men to lend their service in advice both for the reconstruction needs of European countries and to the peace delegates of the United States.

Urging the government to encourage the development of foreign trade.

To continue the observance of the Monroe Doctrine, supplemented by a vigorous development of commerical and financial association.

Support for the government in protecting the Mexican rights acquired by Americans.

The preparation of more young men for international commerce.

The continuance of the Forest Products Laboratories.

The adoption of uniform cost accounting by the industries.

The effective support of the congress on the part of the trade press through its publication of the "Reconstruction Conference Daily," led to a resolution that "The Reconstruction Conference hereby tenders its thanks and appreciation of the air so effectively given by the business press of the country."

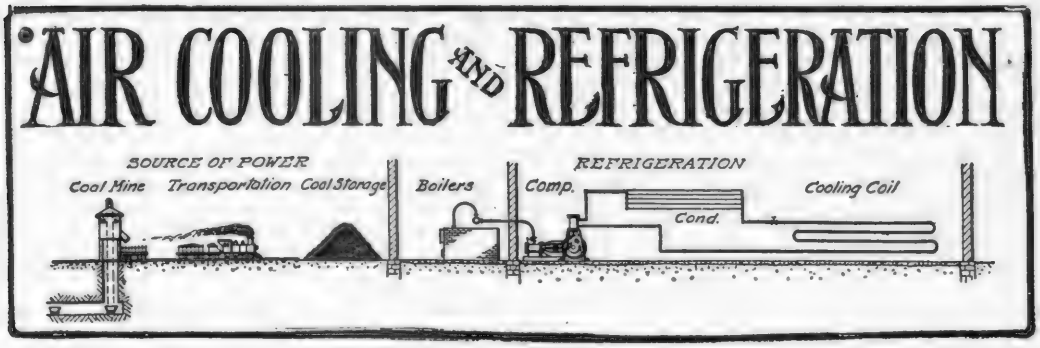
The following resolution was adopted by Related Group No. 35 and by Major Group No. 10, but was not acted upon by the Clearance Committee, although it may be brought in later, as it was one of a number held for further consideration:

WHEREAS, advertising and scientific publicity have proven to be one of the greatest instrumentalities for overcoming the problems and emergencies incident to the achievement of victory in the world war, and in arousing, directing and mobilizing the National Mind of the Nation to a degree never before deemed possible, and

WHEREAS, advertising is not only an incomparable selling force, but also a means for conserving man-power, for speeding up old industries and developing new ones, for cutting the cost of distribution, for assuring the steady employment of labor, and for accelerating all the processes which make for national prosperity, and

WHEREAS, the paramount necessity for developing our foreign trade requires the wide dissemination of information concerning American products, therefore

BE IT RESOLVED, that this conference recognizes advertising and scientific publicity as one of the great and essential forces in accomplishing the reconstruction and maintenance of our industrial life on a high plane of efficiency and prosperity.




# SPECIAL APPLICATIONS OF SMALL AIR-COOLING SYSTEMS

Small refrigeration plants are in many cases a necessity instead of a luxury and upon their application have proved so successful that their wider use is quite assured.

One of the most desirable applications is that of cold storage in the handling and preservation of fruits. The variation of the conditions under which the first is received, the length of time it must be held and the fact that it is often necessary to make rapid changes in the temperature, require the use of a system giving quick adjustment and rapid equalizing of the tem-

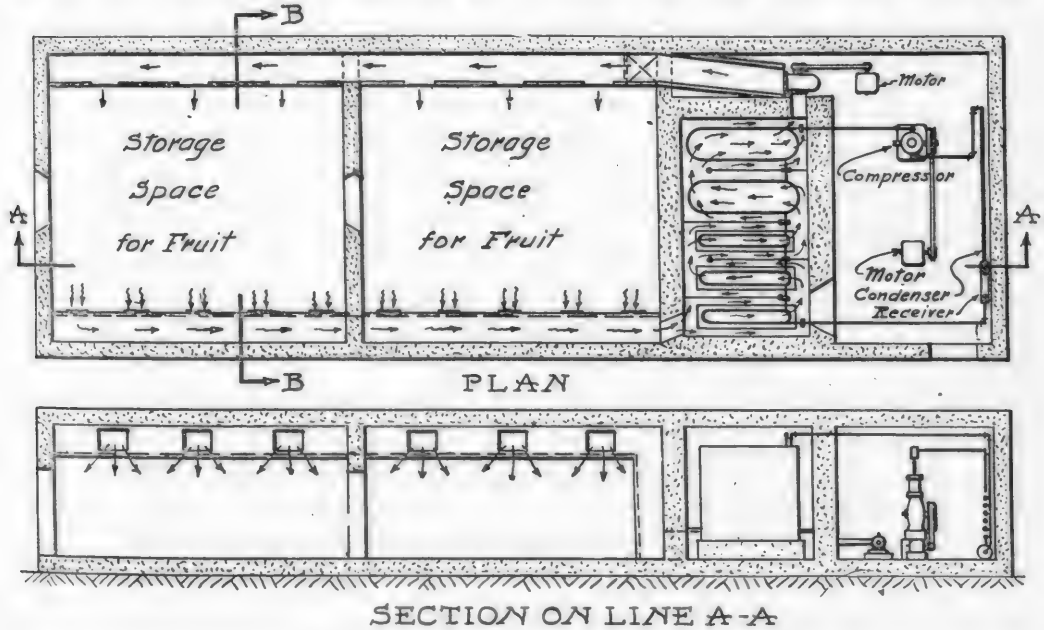



FIG. 1—TYPICAL "COOL AIR" SYSTEM.

perature throughout the storage space. Practical experiment has shown that the air-cooled system is the one which seems to best meet these conditions.

The cool air system may be well termed a "cold blast" system since it follows in the footsteps of the hot blast system of heating except that the air is at a lower temperature than the room and therefore cools it instead of being at a higher temperature and thereby supplying heat. The air in the cooling system is circulated by a fan, being drawn across cooling coils, instead of heating coils, and blown out into the room in which the fruit is kept.

Fig. 1 may be taken as a typical example of such an installation, this view illustrating a plan, longitudinal section A-A and cross section B-B of a banana plant with a capacity of one carload. In this layout two special duct systems are used to carry the air, these being run along the ceiling, as shown in Section B-B, one duct carrying the supply air and the other the exhaust air. The duct outlets are provided with registers to control the air flow and to regulate the temperature.

The cooled air is delivered by the fan into the supply duct and from this duct enters the room at the ceiling through the various outlets with registers. Owing to its lower temperature the air tends to fall to the floor but as it becomes warmed it again rises toward the ceiling at the opposite side of the room and is caught by the exhaust duct. As the end of the exhaust duct is connected to the cooling room from which the fan takes its suction, it follows that the air coming back in the exhaust duct passes through the cooling room, and after being cooled, passes into the fan suction, thus completing the circuit.

The cooling room equipment is one of the most important features of such a plant and this consists of ammonia expansion coils, part of which are exposed to the air and part of which are submerged in large brine tanks. Between the various tanks and coils are placed baffles which are arranged so as to secure the longest air flow possible, these being shown in Fig. 1.

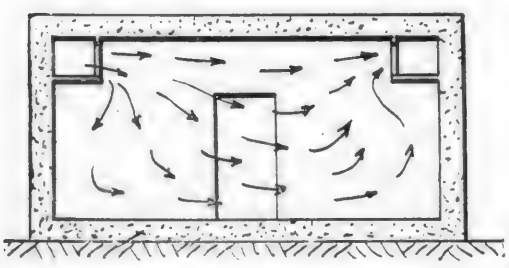


FIG. 1A—CROSS-SECTION ON LINE B-B.

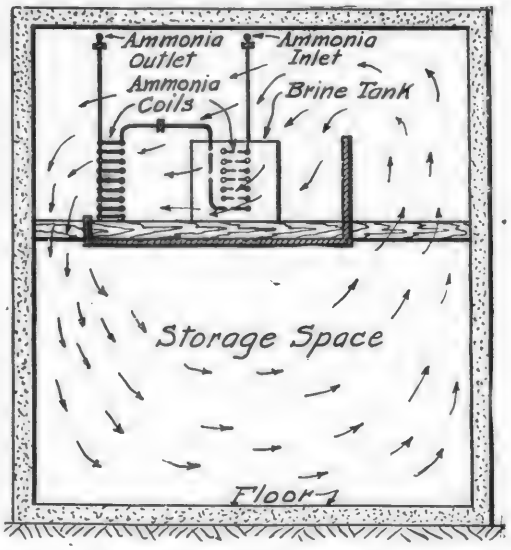



FIG. 2—ARRANGEMENT OF AIR COOLING SYSTEM FOR MEAT MARKETS AND GROCERIES.

The brine serves to extract the excessive heat when the air is coming back warm, leaving the last cooling to the lowest temperature for the ammonia coils as well as to permit the shutting down of the ammonia plant from time to time by using the heat absorption capacity of the brine to hold down the temperature during the interval. This not only cuts down the operating cost but also makes the plant independent of temporary interruption of the electric power service such as sometimes occurs.

The ammonia plant is of standard expansion type, operated by motor or engine, and simply supplies the liquid ammonia to the coils in the cooler room.

The proper temperature for various products will approximate the following:

| *Articles.* | *Degrees F.* |
|---|---|
| Apples | 30–36 |
| Asparagus | 33 |
| Bananas | 55 |
| Beans, fresh | 32 |
| Beans, dried | 45 |
| Beef, fresh, short carry | 35 |
| Beef, fresh, long carry | 30–32 |
| Beer, in barrels | 33 |
| Beer, in bottles | 45 |
| Berries | 36 |
| Butter | 14 |
| Butterine | 20 |
| Cabbage | 33 |
| Cantaloupes, short carry | 40 |
| Cantaloupes, long carry | 33 |
| Carrots | 33 |
| Cheese | 33–38 |

| | |
|---|---|
| Chocolate, dipping room | 65 |
| Cider | 32 |
| Celery | 32 |
| Cigars | 42 |
| Corn, dried | 34 |
| Cranberries | 33 |
| Cream | 33 |
| Cucumbers | 38 |
| Currants | 32 |
| Dates | 55 |
| Eggs | 32 |
| Figs | 55 |
| Fish, fresh water, frozen | 18 |
| Fish, salt water, not frozen | 16 |
| Fish, to freeze | 5 |
| Flowers, cut | 36 |
| Fruits, canned | 40 |
| Fruits, dried | 40 |
| Game, short carry | 28 |
| Game, after frozen | 10 |
| Game, to freeze | 0 |
| Ginger Ale | 36 |
| Grapes | 36 |
| Honey | 45 |
| Hops | 32 |
| Huckleberries, frozen | 20 |
| Ice | 28 |
| Ice cream, short carry | 15 |
| Lemons, short carry | 50 |
| Lemons, long carry | 36 |
| Lambs | 32–40 |
| Lard | 40 |
| Livers | 20 |
| Maple Syrup and Sugar | 45 |
| Meats, salt, after curing | 35 |
| Mutton | 32–40 |
| Nursery Stock | 30 |
| Oleomargarine | 40 |
| Onions | 32–35 |
| Oils, cotton seed | 35–40 |
| Oranges, short carry | 50 |
| Oranges, long carry | 34 |
| Oxtails | 30 |
| Oysters, in tubs | 25 |
| Parsnips | 32 |
| Peaches | 36 |
| Pears | 33 |
| Peas, dried | 40 |
| Plums | 33 |
| Pork | 30 |
| Potatoes | 34 |
| Poultry, short carry | 28 |
| Poultry, after frozen | 10 |
| Raisins | 55 |
| Ribs, not brined | 20 |
| Salt Meat, curing room | 32 |
| Sardines, canned | 35 |
| Sausage Casings | 20 |
| Scallops, after frozen | 16 |
| Shoulders, not brined | 20 |
| Sugar | 45 |
| Syrup | 45 |
| Tenderloins | 33 |
| Tomatoes, ripe | 42 |
| Watermelons | 32 |
| Wines | 45 |
| Wheat Flour | 40 |
| Woolens | 28 |

SYSTEM FOR MEAT MARKETS AND GROCERY STORAGE.

There is also another arrangement which is cheaper to operate and which is proving quite popular in meat markets and grocery storage uses. This is illustrated in Fig. 2 consisting of practically the same apparatus as shown in Fig. 1 except that the fan and ducts are omitted and the cooler room is placed *above* the storage room by means of which it is possible to maintain a gravity circulation, the warmer air at the top of the room being cooled by the cooling surface

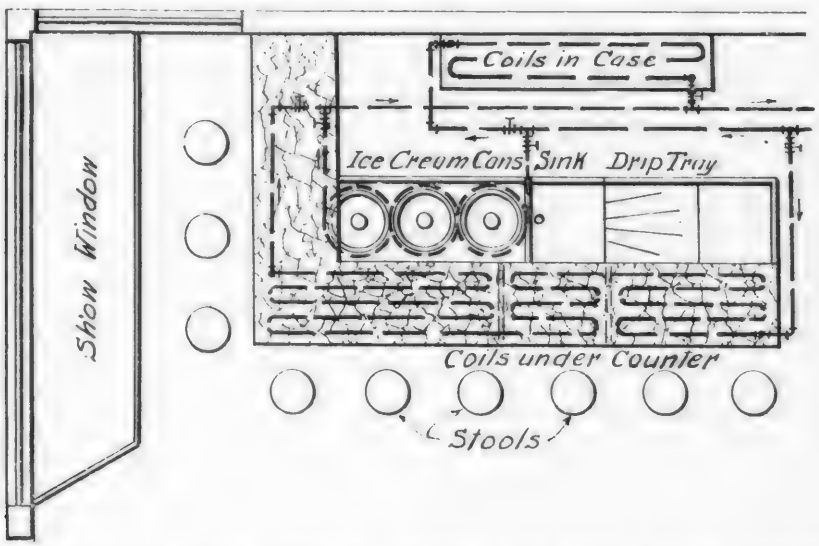



FIG. 3—ADAPTATION OF AIR COOLING SYSTEM FOR SODA WATER FOUNTAINS.

and dropping down its place being taken by warmer air from below.

ARRANGEMENT FOR SODA WATER FOUNTAINS.

Fig. 3 shows the adaptation of this system for use in connection with soda water fountains. Here ammonia coils are carried

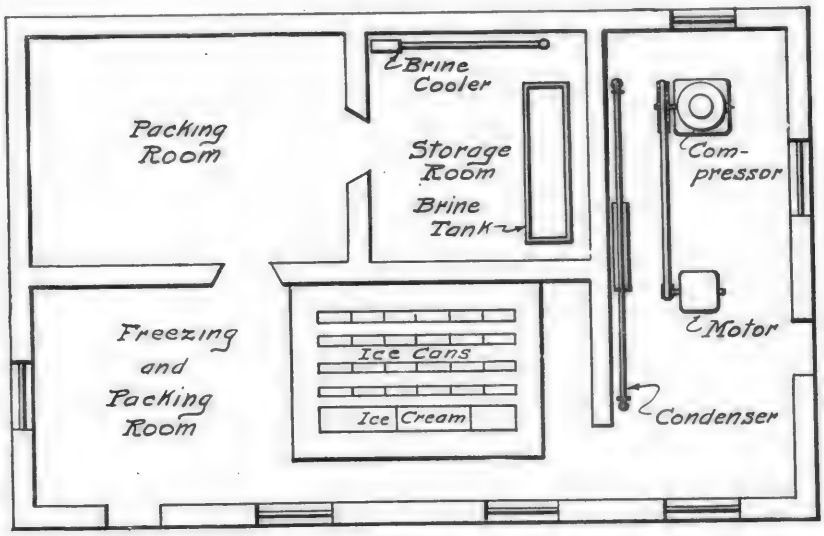



FIG. 4—EQUIPMENT FOR ICE CREAM PLANT.

around the cream cans, under the syrup jars and around the carbonated water coil. Another coil is located in the case in the rear for the various bottles, fruits, etc. which are not used so frequently. Such installations by pleasing the patrons have given the owners much satisfaction, to say nothing of preventing losses from fermentation and mold.

Small ice cream plants in combination with ice making for institutions, etc., are very economical and satisfactory. Such plants usually consist of an arrangement somewhat as shown in Fig. 4 where the cream and ice is frozen in the freezing and hardening room, stored to ripen in the storage room and then packed ready for delivery in the packing room.

## The Waste and Abuse of Steam.

We have heard a great deal during the past year or two on the waste of coal, but to many the matter will be brought closer home by considering the waste and abuse of steam. In a paper read before the Providence Engineering Society, recently, Henry W. Ballon said, on the subject:

What the manufacturer needs to help him conserve coal is not information about the refinements of the economic use of steam, but ceaseless reiteration of the simplest platitudes about steam. Platitudes as simple as this:

"If steam can be seen anywhere out of doors, coal is being wasted."

Hundreds of cases come under our observation where steam traps are either leaking or are by-passed and where the leakage is a source of direct waste. The discharge from traps is frequently connected directly to the sewer where leakage is invisible, and waste may go on for months and even years undetected. This subject of leaky traps is a long story, but therein lies a great possibility. Nearly every steam plant has steam traps, and sometimes there are hundreds of steam traps in a single factory. Yet it is probable that not one plant in ten has its traps so equipped and connected that they can be readily tested for leakage.

HEATING OF WATER.

It is quite common in plants using large quantities of hot water to find this water being heated by live steam, while at the same time exhaust steam is being wasted to the atmosphere. This matter needs little comment as it is obvious that great economies can be effected by using exhaust steam for this purpose.

There is, on the part of owners and managers, a universal prejudice against exhaust steam. This prejudice also extends to superintendents and foremen, and it becomes

virulent with the workmen. They all know that high-pressure steam will make more commotion and racket than exhaust steam. They know that high-pressure steam will make water boil harder. Most manufacturers are confident that there is some magic property in live steam that is lacking in exhaust steam, even at the same pressure.

A large part of the failure of some exhaust-steam systems is attributable to a feeling that exhaust steam is cheap and may therefore be wasted with impunity.

Platitudes for exhaust steam should be about as follows:

*Nine-tenths of the coal used in making steam goes into latent heat.*

*In making steam nine-tenths of the coal is used before we get an ounce of steam pressure.*

*When you waste exhaust steam, you waste nine-tenths of the coal used in making live steam.*

As a general statement it can be said that little or no attention is paid to securing economical operation of heating systems for buildings. Many plants operating non-condensing engines have a surplus of exhaust steam available for heating at all times when the prime movers are running. Under these conditions this steam is likely to be carelessly used, there being a feeling that, because it is exhaust steam and there appears to be no other use for it, it is not necessary to use it economically—the result oftentimes being that radiation is not properly trapped and various drains and bleeders discharge directly to the sewer. Under these circumstances waste of live steam occurs at night and on holidays, at such times as the heating system must be operated with live steam, which in this climate in an ordinary manufacturing plant is a considerable number of hours yearly. Obviously, all open ends become sources of waste when live steam is in use.

Exhaust steam, where available, can frequently be substituted for live steam in heating coils with slight changes in the equipment.

In some cases it has been found possible to extract a certain amount of steam from a compound condensing engine or turbine such steam first performing a certain amount of mechanical work and then giving up its latent heat (amounting to 90% of the total heat) to the heating system. A specific instance may be noted where in a cotton-mill plant, the steam which passes through one of the turbines is used in the heating system during the winter months, the unit being operated condensing in the summer months. This is a change made during the present winter which has resulted in a reduction of the load on the boiler plant amounting to more than 200 horse-power.

Hotel-heating systems are as a rule very wasteful, because there is a great tendency toward overheating. Many mills, office buildings, etc., are overheated during most of the winter months.

## Report of Proposed License Law for Engineers.

The proposition of advocating a standard license law for engineers has been taken up by the American Association of Engineers and a special committee on the subject has already made a preliminary report in which it is stated that "while there is no official record, there appears to be a growing opinion in favor of engineers' license cense laws, especially in the States where laws, especially in the States where such are given, as set forth by the American Society of Civil Engineers and a list is added of States already having some form of license law, including Louisiana (surveyors and civil engineers), Wyoming (water conservation and irrigation work engineers and surveyors), Illinois (structural engineers), Florida (civil engineers). The States in which similar laws are or have been considered are also given, including New York, where a bill was introduced in 1911 by the Technical League for licensing engineers; Pennsylvania, where a bill for licensing was introduced in 1909; Iowa, where a carefully-drawn bill was introduced in 1916, but failed to pass; Ohio, where a bill was introduced in 1910; Colorado, where a bill was formulated by the Colorado Society of Civil Engineers and is still under consideration; Minnesota, where a committee has been appointed by the Minnesota State Engineers' and Surveyors' Society to report upon the question of licensing engineers; and Michigan, where a bill has been formulated for the registration of civil engineers.

"Bank and Public Holidays Throughout the World" is the title of a new and enlarged edition of the book issued a year ago by the Guaranty Trust Company, of New York. A limited number of copies are available upon request.

Clarage Fan Co., Kalamazoo, Mich., announces the return to its organization of Lieutenant Louis O. Monroe. Lieutenant Monroe assumed the duties of manager of sales and chief engineer for this company on Jan. 1. He was formerly in charge of the company's Chicago office.

# MODERN PRACTICE IN VAPOR HEATING

## VII.—The Broomell System.

Editor's Note.—*For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or therograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

The Broomell vapor heating system as supplied by the Vapor Heating Co., York, Pa., differs from the other vapor systems already discussed principally in its combination receiver-draft regulator-gauge-relief valve. The operation of the system is similar to that of the other vapor systems already described, the steam flow from the boilers to the radiators being identical and its admission to the radiator controlled by a graduating valve. A typical layout of piping is shown in Fig. 1.

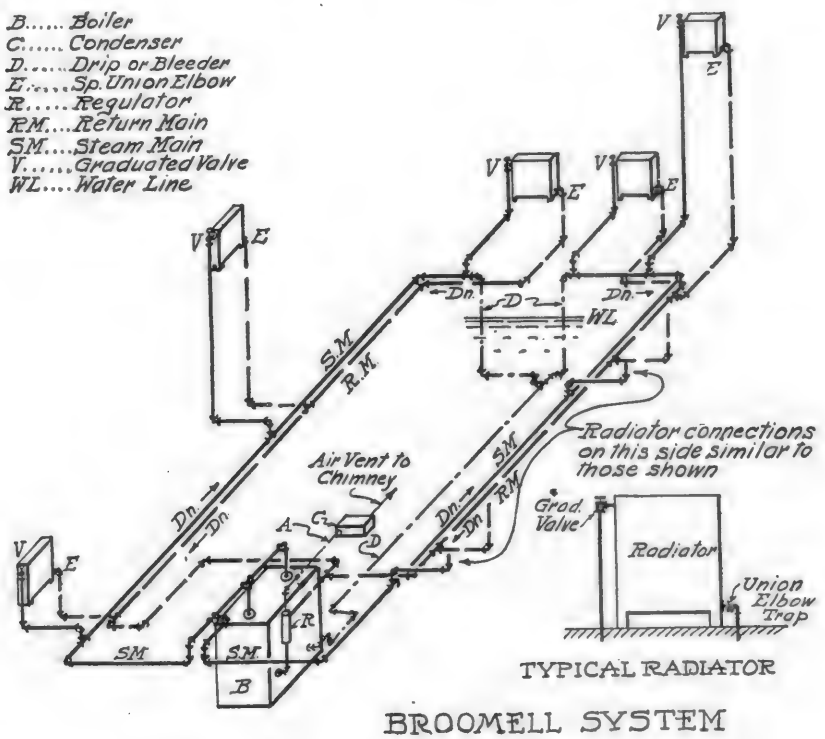



FIG. 1.—TYPICAL LAYOUT OF THE BROOMELL SYSTEM.

The steam main illustrated in Fig. 1 starts off with the high point at the boiler and pitches down from the boiler to the end of each circuit where a bleeder is placed to care for the main condensation, each bleeder dropping down below the water line and then connecting into the line run back to the boiler and connected to one of the return connections.

The pitch of the steam main is downward in the direction of flow and should not be less than ½-in. in 10 ft., with more if possible. Where circumstances make it necessary to pitch the main or its branches back against the steam flow the pitch should not be less than 2-in. in 10 ft., with more if possible. The size of the main is determined by the schedule shown in Table I.

The drop in pressure is so small when the steam main is sized on this schedule as to sometimes be less than 2 oz. in a 12-story building, and the cross sectional area will be found to be about 0.009 sq. in. per square foot of radiation.

The supply and return connections are

TABLE I.

| Radiation Square Feet | Supply Inches Diam. | Return Inches Diam. |
|---|---|---|
| 100- 300 | 2½ | 1 |
| 300- 500 | 3 | 1¼ |
| 500- 900 | 3½ | 1½ |
| 900- 1500 | 4 | 1½ |
| 1500- 2000 | 4½ | 2 |
| 2000- 3000 | 5 | 2½ |
| 3000- 5000 | 6 | 2½ |
| 5000- 9000 | 7 | 3 |
| 9000-14000 | 8 | 5 |

branched directly from the main for all first-floor radiators and all supply branches either to first-floor radiators or to risers are pitched back toward the main. The sizes of the pipe used for supply branches depend on the size of the radiators fed and their distance from the riser or main, but are usually made one size larger than the riser. All the vertical supply pipes from the ends of the lateral runs up to the radiator graduating valve are ¾-in. in size up to the valve. The lateral supplies connected to vertical risers must in no case be less than one size larger than the vertical pipe. The risers themselves are sized from the schedule shown in Table II.

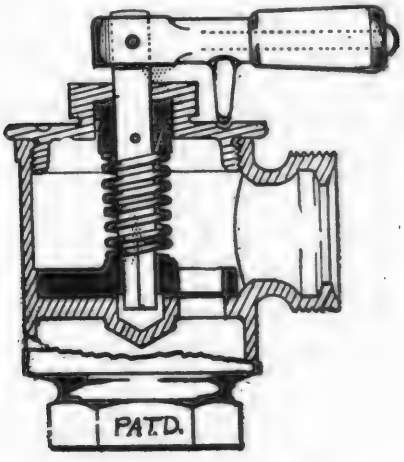



FIG. 2—CONSTRUCTION OF QUINTUPLE GRADUATING VALVE.

TABLE II.

| Radiation Square Feet | Supply Inches Diam. | Return Inches Diam. |
|---|---|---|
| 100-Less | 1 | ¾ |
| 100- 200 | 1¼ | ¾ |
| 200- 300 | 1½ | ¾ |
| 300- 500 | 2 | 1 |
| 500- 800 | 2½ | 1 |
| 800-1000 | 3 | 1¼ |
| 1000-1200 | 3½ | 1½ |
| 1200- | 4 | 1½ |

The graduating valve operates by the passing of one or more small orifices over an opening so as to control the steam supply in steps according to the number and size of orifices over the opening. The interior

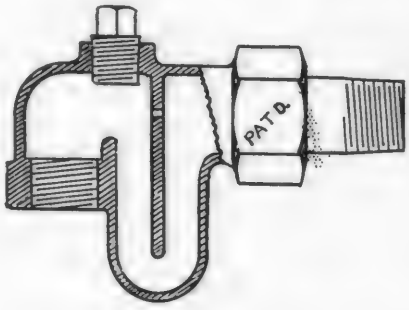



FIG. 3—WATER-SEALED UNION ELBOW USED AS RADIATOR RETURN CONNECTION.

construction of this valve is shown in Fig. 2, it being known as the "Quintuple" valve from the fact of possessing four ports or orifices. Supply valves are made in six sizes for ¾-in pipe and one for 1-in. pipe (No. 6). The sizes of the valves used on various capacity radiators is given in Table III.

TABLE III.

Sizes of valves for different-sized radiators.

| Size of Radiator, Square Feet | Valve ¾-in. taaping |
|---|---|
| Up to 15 | No. 0 |
| 15 to 35 | No. 1 |
| 35 to 70 | No. 2 |
| 70 to 100 | No. 3 |
| 100 to 140 | No. 4 |
| 140 to 200 | No. 5 |
| 200 or more | No. 6 |

Valves Nos. 0 to 5 inc. have ¾-in. tapping; No. 6 has 1-in. tapping.

The radiators have top inlet and bottom outlet at opposite ends and are, of course, of the hot-water type; the surface is figured on the basis or 200 B. T. U. per square foot of radiation and no addition is made for "condensing" as the vapor heats the radiator all the way up to the return end.

On the return connection of all direct radiators a special water-sealed union elbow is used, its construction being illustrated in Fig. 3. The design of this ell permits the ready flow of condensation through the water seal while the air is relieved gradually through the small bypass hole in the partition above the seal.

On the return connection of indirect rad-

iators a return trap is used, shown in Fig. 4, which, incidentally, is of recent design. This trap is thermostatic in action and has free passage for the water of condensation and air until the radiator is entirely full of vapor. When the vapor passing into the return connection strikes the metal diaphragm, it is designed to expand and close the outlet, thus preventing loss of vapor. A change of one or two degrees in temperature, due to condensation of vapor, causes the valve to open for the passage of water. The operation of this return trap effectually prevents any loss of vapor through the return should the heat register or cold-air damper be closed preventing the circulation of air through the radiator.

From the return ells the air and condensation flow back to the main return pipe and thence to the water seal at the top of the receiver.

Here the water-seal causes a separation of the air and condensation, the air passing up into the air line which is connected to the chimney. In this line is placed a small amount of condenser surface for the purpose of reducing to water any vapor which may be contained in the air, thus making the air

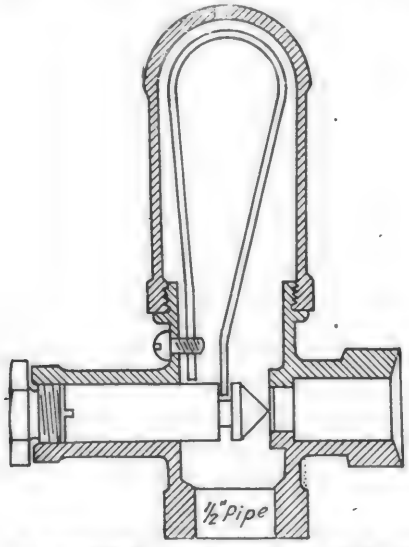



FIG. 4—RETURN CONNECTION FOR INDIRECT RADIATORS.

exhaust into the chimney absolutely dry. The chimney draft produces a slight vacuum on the return lines which results in drawing the air out of the radiators and piping in a quick and efficient manner.

In running the return main the line is started high at the point farthest away from the boiler and pitches down continuously to the entrance of combined regulator-receiver at a grade of not less than ½-in. in 10 ft. The return connections from the first-floor radiators are run through the floor and are then connected to the return main, being pitched toward the main. The horizontal runs between the union elbow and the riser for radiators on upper floors pitches toward the riser and are made ¾-in. in size while the risers are as in Table 2 and are connected to the return main through horizontal branches which pitch down toward the main.

After being separated from the air the water of condensation sinks down in the receiver and eventually finds its way into the boiler through the lower pipe connection.

A detail of the receiver is shown in Fig. 5 and it will be noted that the water in the receiver has its surface vented to the air through the opening in the shell just above the relief valve; the return inlet at the same time is water-sealed, as well as the air pipe outlet.

A heavy copper ball-float rides in the water contained in the receiver, this float being connected by chains to the boiler drafts. The raising of any pressure in the boiler backs up the water in the receiver so as to raise the ball-float connected with the damper chains, which operation is secured with a 2-oz. range of pressure or even less.

The receiver can be set to shut off the drafts at any desired pressure, between zero and 12 oz. In mild weather, for instance, probably 1 or 2 oz. would be sufficient, while in extreme weather 4 to 6 oz. might be desired.

In case the drafts stick, or the ash-pit door has been left open so as to cause the fire to keep on raising the pressure, the float will then rise farther as the water continues to back up in the receiver until it lifts the relief valve on the boiler pipe, thus permitting the surplus steam to escape by this path. The relief of this vapor will drop the boiler pressure, allowing the water in the receiver to flow back into the boiler.

The relief valve also prevents any possibility of the water overflowing from the top of the receiver, as the height of the water in the receiver is determined by the boiler pressure; hence, if the relief valve relieves and prevents the formation of such pressure there can be no overflow. The adjusting rod which operates the relief valve is usually set to open the valve at 7 to 10 oz. of pressure.

In addition to the relief valve which forms part of the vapor receiver, there is used an auxiliary relief valve which is set in the supply main at some point close to the boiler. This valve is set to blow off at 8 oz. and in conjunction with the valve on the receiver, thus gives immediate relief of pressure.

The distance between the water-line and

of the extreme high water of the receiver should never be more than 18-in. so that the maximum boiler pressure cannot exceed ¾ lb. Tappings for these receivers are as given in Table IV.

TABLE IV.

| Radiation Sq. Ft. | Receiver Size | Return Tapping In. Diam. | Air Line In. Diam. |
|---|---|---|---|
| 2000 or less | No. 1 | 2 | 1¼ |
| 2000-4000 | No. 2 | 2½ | 1½ |
| 4000 or up | No. 3 | 3 | 2 |

the boiler-operated system. This main can also be pitched up against the steam flow for short distances if the pitch is made steep enough for this purpose, as previously described under the boiler system.

The returns, however, are treated differently, this of course being necessary in order to cool the condensation sufficiently to allow it to be discharged into the sewer and to so discharge it after it is cooled. For this purpose a condensing and cooling radiator is used, this generally being 2-col., 45-in. in

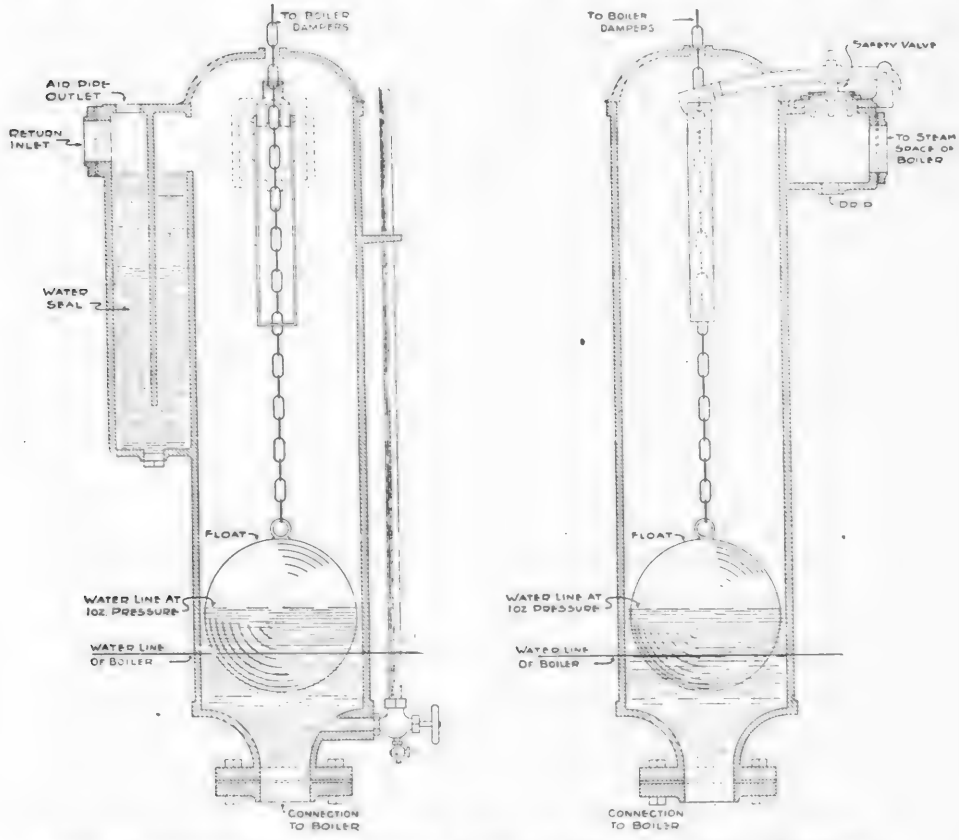



FIG 5—DETAILS OF RECEIVER USED WITH BROOMELL SYSTEM.

When an outside steam supply is to be utilized the arrangement is somewhat changed, as shown in Fig. 6. Here the steam comes in from the street at whatever the street pressure may be and after passing through a stop-valve enters a pressure-reducing valve where the pressure is cut down to 1 lb. or less. Just beyond the pressure-reducing valve a compound gauge is located to indicate the pressure or vacuum which is on the house system. Beyond this point the main jumps up to a high point, the condensation being relieved by a bleeder or drip, as shown, and pitches down to the farthest radiators, just as previously described for

height, the sizes being as called for in Table V.

TABLE V.

| Radiation Square Feet | Condensing Radiation Square Feet |
|---|---|
| 400 or less | 20 |
| 400- 900 | 30 |
| 900-1500 | 40 |
| 1500-2500 | 50 |
| 2500-3000 | 60 |
| 3000-5000 | 70 |

The upper part of this radiator serves as a condenser and takes the place of the separate condensing surface used with the

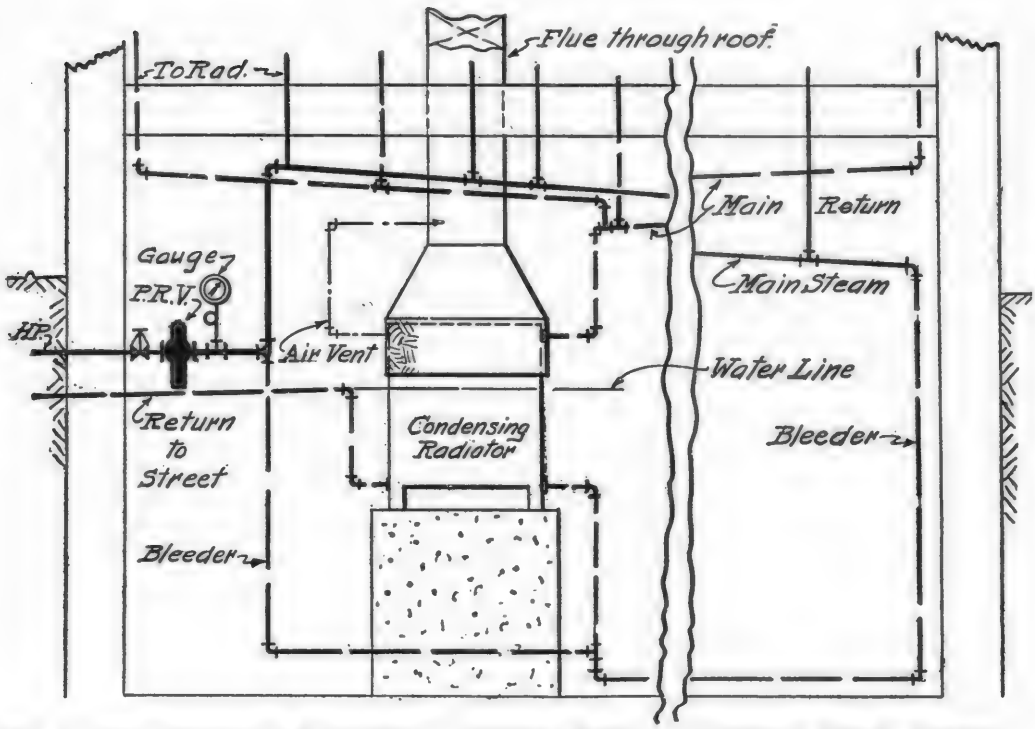



FIG. 6—ARRANGEMENT OF BROOMELL SYSTEM WITH AN OUTSIDE STEAM SUPPLY.

boiler system and shown in Fig. 1. The lower part of the radiator (about two-thirds) is filled with water and acts as cooling surface. On the inlet end of the radiator, which is provided a total of four tappings, the return and drip lines enter the bottom tapping, while the air pipe relieving the air from the return main enters the top tapping. On the outlet end the lower tapping allows the cooler water in the radiator to drain to the sewer while the upper tapping is connected to the air vent which goes into the chimney. The height of water retained in the radiator is controlled by the height to which the overflow is carried in order to enter the sewer. If the sewer is below the floor it is necessary to vent this overflow at the high point to prevent siphonage when the radiator begins to discharge. This vent should be carried out-doors as it may emit sewer gas at times.

The cooling and condensing radiator has a hood placed over the top with the hood outlet run to the outside air either by connecting it to an existing flue or by running up a special metal pipe specially for this purpose.

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The Thompson Heater Corporation, 37 Church St., Buffalo, N. Y., announces that it is about to bring out a new book on "Heat Transfer," by Charles B. Thompson.

**Kerosene vs. Coal as a Fuel.**

The appearance recently of a number of kerosene burning heating systems as a solution of the coal problem has brought forth the inquiry as to whether, from an economy standpoint, there is any saving in substituting kerosene for coal. Of course, where there is a scarcity of coal kerosene has, in many cases, proved a most welcome substitute at any price.

In a recent circular featuring the Doble system of heating with kerosene oil some interesting figures are given which, when carefully analzyed, show that kerosene has yet a long way to go to compete successfully with coal. The point may be made, however, that the disagreeable features of coal heating, such as the shoveling of the coal and the removal of ashes, are eliminated with the kerosene system and should be taken into consideration in making a cost comparison.

From figures determined by such an authority as William Kent, M. E., it is stated that 1 lb. of good coal contains 10,000 B. T. U. One pound of kerosene contains 19,832 B. T. U. Considering a house that required 15 tons of coal per heating season, this would mean 15 x 2000 lbs.=30,000 lbs. which at 10,000 B. T. U.

per pound would mean that 15 tons of coal contains 300,000,000 B. T. U.

Therefore to find the number of pounds of kerosene required to furnish the same number of heat units we must divide the number of B. T. U. obtained from 15 tons of coal by the B. T. U. in 1 lb. of kerosene, or 300,000,000÷15,122 lbs. of kerosene. One gallon of kerosene weighs 6¾ lbs., so that 15,122÷6.75=2,160.28 gal of kerosene would be required to equal 15 tons of coal.

Fifteen tons of coal, even at $10.50 per ton, would cost $157.50. 1793 gal. of kerosene at 12 cents per gallon, would cost $215.16. If an electric motor were used for supplying the kerosene to the burners there would be an additional cost of electric current for, say, six months, which at $2.00 per month, would amount to $12.00.

In connection with this particular estimate it is claimed that the soot formation from coal on the heating surfaces of the apparatus would impair the efficiency of the coal at least 20%, but it might be pointed out that coal with a heat content of only 10,000 B. T. U. would not be considered a very high grade of coal.

On the other hand there is an important factor to consider in the fact that on the milder days of fall and spring heat is not required at all times and it is possible to shut off the kerosene much more easily than to let a coal fire go out and be built again. The reduction in consumption of kerosene that may be obtained in this way will depend on each season's weather. If estimated as high as 10% it would still leave the cost for a season's operation at $194.00 as against $157.50 for coal.

## Revised Rules In Minnesota for Schoolhouse Equipment.

Revised rules of the Minnesota Department of Education relating to school buildings contain the following on the subject of mechanical ventilation, which is the principal change from the previously-published rules:

MECHANICAL VENTILATION.

Sec. 70. Fresh air intakes:

The fresh air intake shall be located so as to secure air as free from dust, smoke, and dirt as possible. It shall have a free cross section area sufficient to secure the required volume of air at a velocity of 1,000 ft. a minute. The opening shall be covered with a substantial wire screen. A suitable damper shall be installed which may be operated from inside the building. The fresh air chamber shall be kept clean at all times and may not be used for storage purposes.

Sec. 71. Tempering coil:

The total heating surface of the tempering coil to be installed in a school building shall be computed from the following data.

1. Temperature of air entering heater.
2. Volume of air to be supplied per minute.
3. Velocity through heater.
4. Free area.

In order to secure at all times proper temperature control in tempering coil, each stack shall be separately valved.

Sec. 72. Size of ducts:

In a plenum fan system of ventilation the sizes of all heat and vent ducts shall be computed on a basis allowing for a velocity from 400 to 600 ft. per minute. Velocities in horizontal ducts shall be computed on a basis of 900 to 1,000 ft. per minute.

Sec. 73. Shape of ducts:

The horizontal dimensions of a vertical duct should approach a square in order to secure a maximum volume of air from a given area.

Sec. 74. Volume Dampers:

Volume dampers are to be placed at the base of each heat flue. Such dampers shall be designed so that they may be adjusted by means of a set screw or other suitable device in order to facilitate an equitable distribution of air.

Sec. 75. Diffusers and deflectors:

Whenever the location of the heat ducts in rooms require the installation of diffusers and deflectors for a proper distribution of air, the opening of such ducts shall be thus equipped. In all other cases a grille is required.

Sec. 76. Velocity at outlet:

The velocity of the air through the grille or diffuser shall not exceed 400 ft. a minute.

Sec. 77. Fans:

All fans must be so designed, constructed, mounted and connected with motor that they will operate noiselessly and without vibration. Normal speed of fans shall be kept as low as possible, taking into full consideration the type of fan to be used, the resistance to be overcome, and the volume of air to be delivered. Specifications must state explicitly the type of fan, its outlet velocity, its capacity, and its normal speed.

Sec. 78. Operation of fans:

All fans shall be in constant operation during the entire time the schools are in session. The temperature of the air entering schoolrooms shall be not more than 90° F. in zero weather, when the room is heated by direct radiation, and when no direct radiation is installed, the temperature of the air entering the room shall be not more than 125° at zero F.

## Use of Salt in Heaters to Eliminate Soot.

In a letter to power plant and domestic operators of boilers sent out by Joseph Harrington, administrative engineer for the Illinois Fuel Administration, the use of salt is recommended to prevent the formation of soot in burning the local coals in that section.

"One of the most difficult problems," writes Mr. Harrington, "which conservation engineers in the State of Illinois encounter in the burning of local coal in both steam boilers and house-heating furnaces is the removal of the excessive deposit of soot on a boiler reduces the transmission ing surfaces of the boilers. This tar or soot has an insulating value far in excess of any commercial insulation. 1/32 in. of soot on aboiler reduces the transmission of heat approximately 10,% and 20% for 1/16 in. In view of the well-known fact that heating surfaces quickly become covered with soot as thick as the foregoing, the great importance of some method of removing it becomes apparent.

"It gives the writer considerable pleasure to be able to advise both power plant and domestic operators of boilers that a method has been discovered whereby it is entirely feasible to remove soot without the necessity of letting down the boiler, or additional expenditure on labor. It is my pleasure to acknowledge the debt I owe to Mr. C. J. Causland, electrical engineer of the Pennsylvania Railroad Company, Chicago district, and Jerome Kohout, Chief chemist of the Commercial Testing and Engineering Company, Chicago, for their success and assistance in developing the facts relative to this process.

This process is in brief, the appliance of common salt to the fire under conditions which will produce disassociation of the sodium and chlorine forming the salt and the subsequent combination of these elements with the carbon of the soot to form a substance which then passes off as a gas or drops off the heating surface. The practice is briefly as follows:

METHOD OF APPLYING SALT.

The fire is put into good condition with a substantial body of hot fuel. Common salt, previously dried, is then thrown or sprinkled onto the incandescent fuel bed in a quantity depending entirely on the size of the furnace. In the case of a household furnace a pound at a time is ample, in the case of a large power plant boiler, four or five scoops full may be required. The dampers are kept open so as to maintain the furnace temperature and the salt is allowed to remain until the fumes have entirely disappeared.

Immediately upon charging the salt, the furnace becomes filled with dense white fumes which may require as much as half an hour to entirely disappear. If results are not secured on the first application, it should be repeated as many times as necessary. Once the heating surface is thoroughly cleaned, a small application every few days is usually sufficient to keep it so.

Common salt is composed of only two elements—sodium and chlorine. Both are very reactive substances; the first a metal, and the second a corrosive gas. When salt is thrown upon incandescent coal, it is vaporized and probably decomposed, at least in part, into its original elements. The chlorine, being acidic in character, would attack the iron. Ferric chloride is volatile in high temperatures and would, therefore, disappear in the form of gas; or at least a sufficient amount would be volatilized to render the deposit porous and weak and so loosen it that it would fall from the tubes of its own weight.

The sodium of the salt would immediately oxidize to sodium oxide, or sodium peroxide. This material being basic would not attack iron, but would be carried out of the furnace and deposited with the soot on the heating surface of the boiler. The sodium oxide would thus introduce oxygen into the carbonaceous matter in the soot, and at an elevated temperature would cause an oxidization of this material. Carbon dioxide and carbon monoxide are gases which would pass out of the stack with the furnace gases.

The application of this method of cleaning heating surfaces, presents possibilities which are of tremendous significance to power plant owners.

The boiler can be cleaned when in service without the use of special equipment, extra labor or interruption to the use of the boiler. The heating surfaces are cleaned to the utmost corners and two years' experience shows absolutely no deterioration of either brick work or boiler

tubes. It is an economy which represents enormous savings and all the evidence at hand shows it to be thoroughly practical.

# LEGAL DECISIONS

### Warranty Test.

In an action by a steam heating company on a mechanics' lien claim to recover the price of certain steam heaters furnished to the defendant, a florist, the evidence tended to show that the plaintiff, at the defendant's request, sent its salesman to the defendant's greenhouse for a consultation as to the number and sizes of heaters required for the florist's purposes, and the salesman examined the premises, took measurements, and told the florist, who disclaimed any knowledge of the number and sizes required, that a No. 11 and a No. 12 would supply the heat required, and agreed to furnish them. It was held, Spencer Heater Co. v. Abbott, New Jersey Court of Errors and Appeals, 104 Atl., 91, that it was open to the jury to find that there was a warranty of the fitness of the heaters for the purposes contemplated. The question whether or not a statement of affirmation accompanying a sale is a warranty depends upon whether the conditions were such that the buyer had a right to understand, and did understand, that what was said by the seller was meant as a warranty. A decisive test is whether the buyer is ignorant, or merely states an opinion or judgment upon a matter of which the seller has no special knowledge, and on which the buyer may be expected also to have an opinion, and to exercise his judgment. In the former case there is a warranty; in the latter, not.

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### Jurisdiction of Commission to Change Heating Rates.

In November, 1917, the Union Electric Light & Power Company filed with the Missouri Public Service Commission an application "for emergency relief to enable it to meet the increased cost of heating service" in St. Louis. Certain consumers intervened and challenged the jurisdiction of the commission on the ground that the company was a private corporation, and had no franchise from the city specially authorizing it to engage in the steam heating business. The commission holds that that fact does not deprive it of jurisdiction of the steam heating branch of the company's business. It appears that the company has been granted numerous permits from the proper city authorities authorizing it to lay its pipes for steam heating purposes in the streets and alleys of the city. Thus the city has officially recognized the fact that the company is actually engaged in that business. The charter from the state authorizes it to engage in the heating business. The heating business is defined as a public utility by the Missouri Pubilc Service Commission Law. It does not affect the question that the company does not convey the steam through the streets or other public places, but furnishes it to the consumer by means of a plant located on his premises and leased from him. Nor does the mere fact that the company had failed to file a schedule of rates for steam heating render it a private company rather than a public utility subject to the regulation of the commission.

A company does not act in a private capacity because it furnishes steam heat under long-term contracts at fixed compensation, using the plants of its patrons, the company not being required to furnish any capital investment, but only fuel, labor and supplies. The commission holds that it has power to change rates for steam heating fixed by long termed contracts since the provision of the Missouri statute that nothing in the act shall be construed to prevent any telegraph or telephone corporation from continuing to furnish service under a contract in force at the date when the act took effect cannot be construed to apply to heating companies. It is immaterial that the only provision in the act with reference to heating companies is contained in the article dealing with telegraph and telephone companies. The commission did not approve the schedule of rates proposed by the company, but suggested a different schedule, and retained jurisdiction of the case for the filing of the suggested schedule, and the introduction of such further evidence as is deemed necessary in order to justify same and for the making of a further order in the case.

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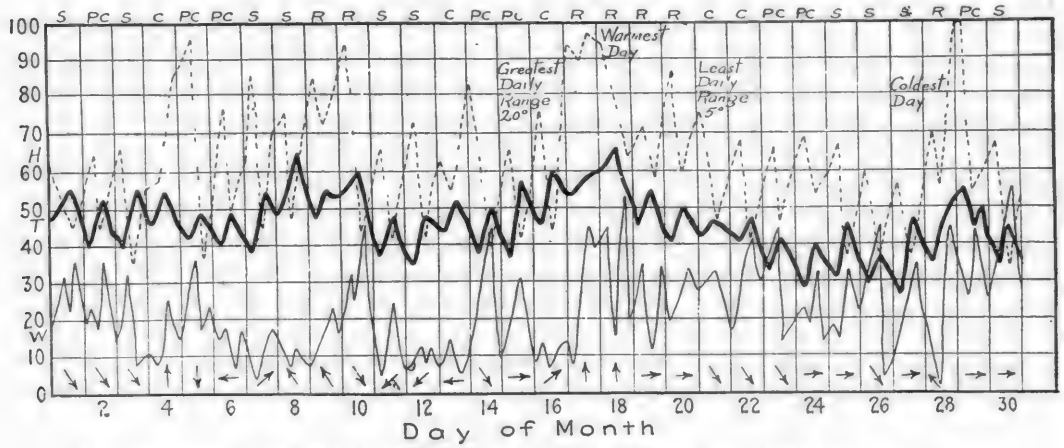
Henry Sims, Sr., president of Sims Co., Erie, Pa., and Mrs. Sims received the congratulations of their many friends in Erie on the occasion of their golden wedding anniversary, on December 14.

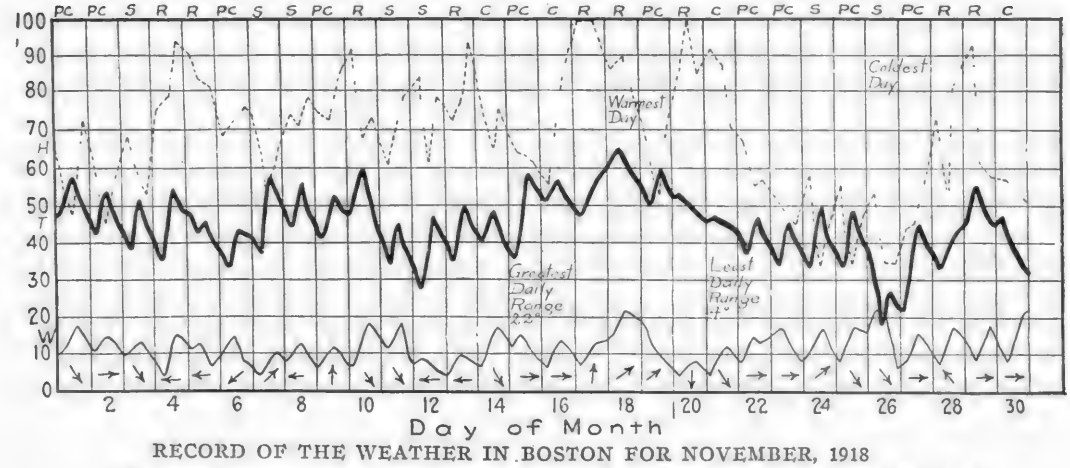
# THE WEATHER FOR NOVEMBER, 1918

| | New York | Boston | Pittsburgh | Chicago | St. Louis |
|---|---|---|---|---|---|
| Highest temperature, degrees F | 65 | 65 | 67 | 68 | 75 |
| Date of highest temperature | 18 | 18 | 7 | 6 | 6 |
| Lowest temperature, degrees F | 27 | 19 | 27 | 21 | 27 |
| Date of lowest temperature | 27 | 26 | 25 | 24 | 25 |
| Greatest daily range, degrees F | 20 | 22 | 27 | 24 | 27 |
| Date of greatest daily range | 15 | 15 | 28 | 6 | 2 |
| Least daily range, degrees F | 5 | 4 | 3 | 3 | 3 |
| Date of least daily range | 21 | 21 | 21 | 21 | 22 |
| Mean temp. for month, degrees F | 45.7 | 45 | 44 | 43.5 | 46.2 |
| Normal mean temp. for month, degrees F | 44 | 41.2 | 42.9 | 39.2 | 43.4 |
| Total rainfal inches | 2.04 | 1.2 | 1.79 | 2.65 | 2.73 |
| Total snowfall, inches | None | Trace | Trace | 0.5 | None |
| Normal precipitation, this month, in | 3.44 | 4.1 | 2.55 | 2.5 | 2.88 |
| Total wind movement, miles | 13250 | 7125 | 7683 | 9578 | 9686 |
| Average hourly wind velocity | 18.4 | 9.9 | 10.7 | 13.3 | 13.5 |
| Prevailing direction of wind | N. W. | W. | W. | W. | N. W. |
| Number of clear days | 10 | 7 | 6 | 12 | 11 |
| Number of partly cloudy days | 9 | 11 | 5 | 6 | 6 |
| Number of cloudy days | 11 | 12 | 19 | 12 | 13 |
| Number of days on which rain fell | 10 | 9 | 8 | 13 | 9 |
| Number of days on which snow fell | None | 1 | 1 | 1 | None |
| Snow on ground at end of month, in | None | None | None | None | None |



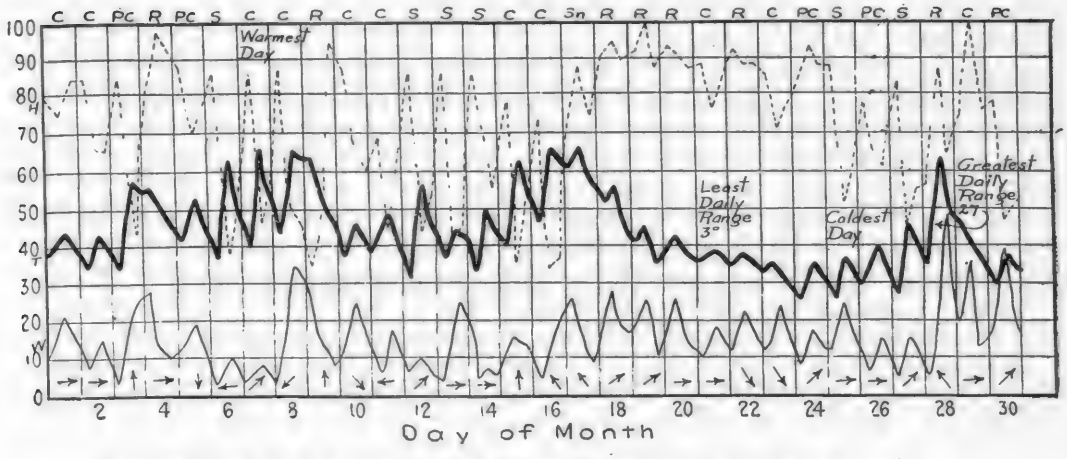

RECORD OF THE WEATHER IN NEW YORK FOR NOVEMBER, 1918.

(Relative Humidity Curve Plotted from Hourly Readings.)

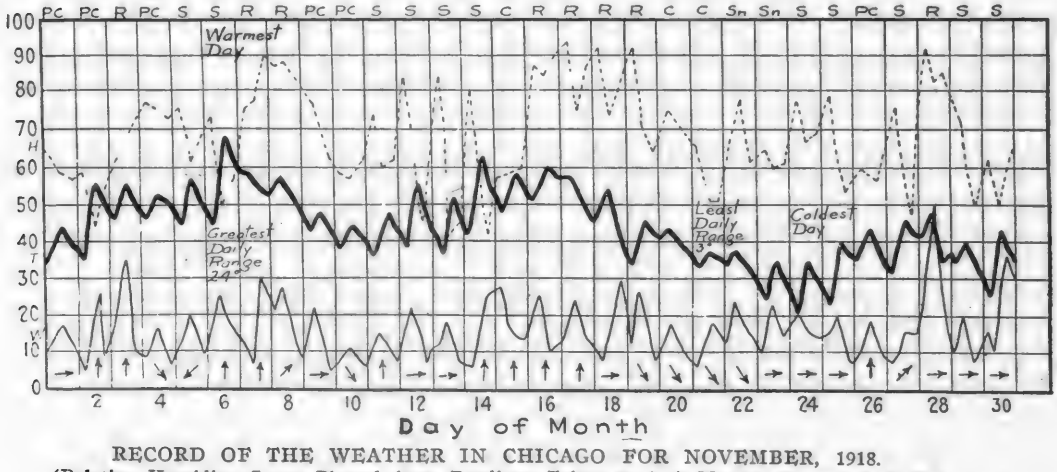



RECORD OF THE WEATHER IN BOSTON FOR NOVEMBER, 1918

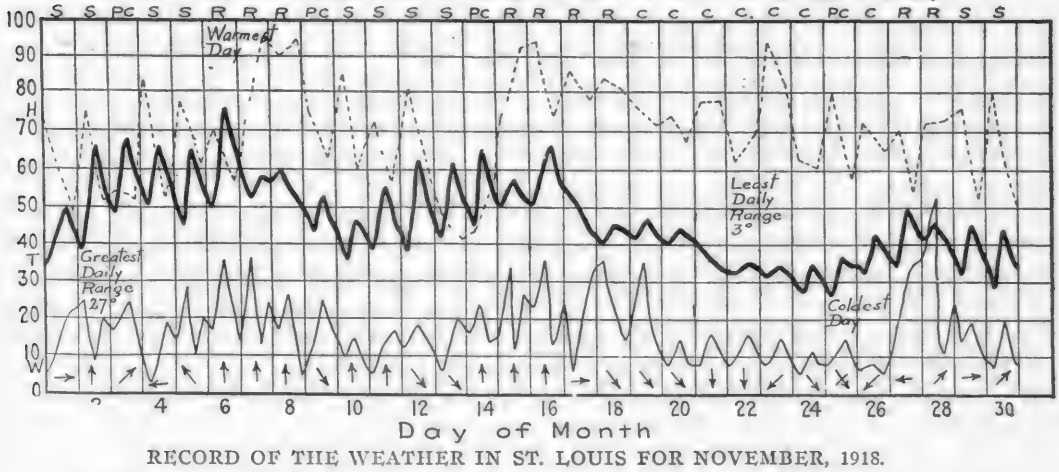
(Relative Humidity Curve Plotted from Readings Taken at 8 A. M., 12 M. and 8 P. M.)




RECORD OF THE WEATHER IN PITTSBURGH FOR NOVEMBER, 1918.
(Relative Humidity Curve Plotted from Readings Taken at 8 A. M., 12 M. and 8 P. M.




RECORD OF THE WEATHER IN CHICAGO FOR NOVEMBER, 1918.
(Relative Humidity Curve Plotted from Readings Taken at 8 A. M., 12 M. and 8 P. M.)



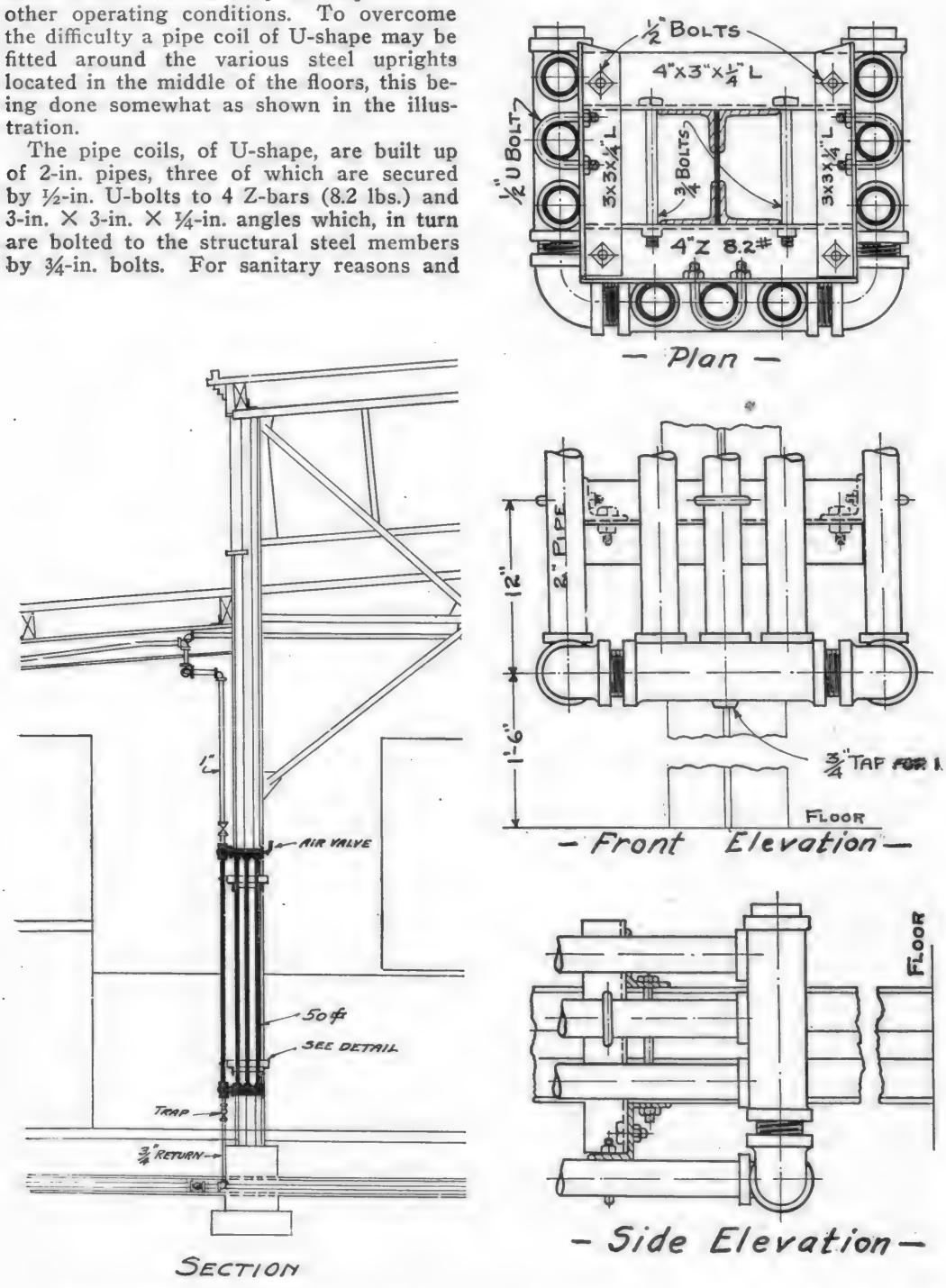

RECORD OF THE WEATHER IN ST. LOUIS FOR NOVEMBER, 1918.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

**Pipe Coils of U-Shape for Steam Heating.**

To heat a factory by direct radiation requires space that is usually taken up by work benches or as may be required for other operating conditions. To overcome the difficulty a pipe coil of U-shape may be fitted around the various steel uprights located in the middle of the floors, this being done somewhat as shown in the illustration.

The pipe coils, of U-shape, are built up of 2-in. pipes, three of which are secured by ½-in. U-bolts to 4 Z-bars (8.2 lbs.) and 3-in. × 3-in. × ¼-in. angles which, in turn are bolted to the structural steel members by ¾-in. bolts. For sanitary reasons and to avoid damage by hand trucks, the base of the pipe coils should be kept up for a short distance from the floor.




ARRANGEMENT OF PIPE COILS IN FACTORY BUILDING TO ALLOW ROOM FOR WORK BENCHES, ETC.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

## Plans for Annual Meeting.

With a membership roll not far from the 1,000 mark and with the establishment of new local chapters in St. Louis and Buffalo, the American Society of Heating and Ventilating Engineers is approaching its forthcoming annual meeting in New York, January 28-30, with every prospect of a record-breaking attendance.

In addition to a report on the results of the campaign for the establishment of a research bureau and a discussion of plans for its scope and management, the programme will include sessions on mechanical ventilation, boiler testing code; and automatic temperature control. Eleven papers are scheduled.

Following are the principal items on the programme:

TUESDAY, JANUARY 28, 2 P. M.

President's address.

Reports of the council, secretary and treasurer.

Reports of committees.

Report of tellers of annual election.

TUESDAY, JANUARY 28, 8 P. M.

"Experiments in Air Conditioning the House," by E. R. Hayhurst, M. D.

"The Argument Concerning Mechanical and Natural Ventilation," by Dr. E. Vernon Hill.

"The Use of Air Washing and Humidification in our School Buildings," by Perry West.

WEDNESDAY, JANUARY 29, 2 P. M.

"Air Duct Design," by Leo Kraft.

"Arrangement of Heating Pipes An Important Factor in Decay of Factory Roofs," by F. J. Hoxie.

"Dust Determinations in Air and Gases," by E. R. Knowles.

WEDNESDAY, JANUARY 29, 8 P. M.

Hearing on Code for Testing Low-Pressure Heating Boilers.

THURSDAY, JANUARY 30, 10 A. M.

*Temperature Control Session:*

"Fuel Conservation by Means of Automatic Temperature Regulation," by F. A. DeBoos.

Report of Committee on Automatic Heat Control.

"A Test of the Conductivity of Window Shades," by John R. Allen.

THURSDAY, JANUARY 30, 2. P. M.

"Limiting the Fuel for Domestic Heating," by Konrad Meier.

"Engineer Economics of Heating," by M. W. Ehrlich.

"By-Product Coke," by William T. Harms.

## New York Chapter Has Exhibit of Temperature Control Apparatus.

A novelty was introduced at the December meeting of the New York Chapter in the way of exhibits of devices for controlling and regulating the temperature, which were presented in connection with the principal topic of the meeting, "Automatic Heat Control." The subject was introduced by Walter S. Timmis, chairman for the evening, by reading the report of a committee on automatic heat control (published in THE HEATING AND VENTILATING MAGAZINE for October, 1918). The manufacturers represented were then given the floor and gave demonstrations of the operation of their devices, explaining in detail their construction features. The success of the innovation led to a suggestion that future meetings be arranged along similar lines.

President Seward called the meeting to order at the Engineering Societies Building after those present had adjourned from Offer's restaurant where they had dinner. He announced that the chapter's entertainment committee for the annual meeting would consist of B. K. Strader, chairman, and Arthur Ritter, G. G. Schmidt and S. L. Gleason.

J. Irvine Lyle was then called upon to give further details of the plans for the society's research bureau. He described the equipment of the Bureau of Mines Building in Pittsburgh where the research bureau will be located and expressed confidence in the success of the campaign to raise the necessary funds to maintain the bureau, based on the reception of the plan as presented by him and others at the chapter meetings in Chicago, Detroit and Philadelphia. He said the quotas of the various cities are as follows: New York $9600, Cleveland, $5600, Chicago $4900, Philadelphia $4200, Western New York $3700 and Pittsburgh $3300.

Mr. Lyle reported that legislation is coming in the way of inspection for heating and ventilation installations and that the trade will be confronted with local inspectors who will have the whip hand unless the profession is able in the meantime, through its research bureau, to ascertain and place its stamp of approval on good practice in this field. The research bureau will enable the society to lead the inspectors, instead of combating them.

Mr. Lyle reported that a new chapter is in process of formation in Buffalo.

M. W. Franklin also discussed the research bureau project, emphasizing the necessity for practical results in research work, the democratic way in which it should be conducted so that the ordinary engineer would be kept in close touch with its operations and findings and the necessity for hav-

ing everybody connected with the industry represented in the movement.

After discussion, the members present endorsed the plan of the canvass committee to make the quota of each member $10.00 each year for a period of five years to maintain the bureau.

The meeting then took up the main subject for the evening. The manufacturers' representatives who spoke and gave demonstrations were Mr. Aldridge for the American Thermostat Company, exhibiting Marvel thermostats; O. O. Oaks for the American Radiator Company, who showed the Arco temperature regulator; A. V. Weidenfeld for the Western Electric Company, who told of the Minneapolis heat regulator handled by this company; and Kennedy Duff, of the Johnson Service Company, who presented this company's line of devices.

William J. Baldwin also brought to the meeting and described a Johnson temperature regulating device of the type used in 1879.

### Illinois Chapter Backs Up Research Bureau Project.

Enthusiastic support of the plan for the establishment of a research bureau by the society was given at the December meeting of the Illinois Chapter when President F. R. Still, Chairman J. I. Lyle of the Research Bureau Committee, and others, presented the subject in detail. Others present from out of town were W. F. McDonald and E. E. McNair of Detroit, all of whom had been visiting various cities in the west in the interest of the bureau and to increase the society's membership.

Mr. Still said that the three most important matters confronting the industry were: first, to increase the society's membership; second, to raise funds for the research bureau; and, third, to carry on experimental work in various cities to determine the relative value of mechanical versus natural ventilation for school rooms.

Mr. Lyle then addressed the meeting. After telling of the progress of the research bureau plans, he intimated that the government was likely to lend its support to the work to be undertaken, especially that connected with fuel conservation.

Other speakers were E. E. McNair, H. M. Hart and W. F. McDonald, who started an increase in membership campaign by assigning names of prospective members to those present.

Before the meeting closed President Still referred to the aid the society had been to the government, especially in connection with the ventilation of submarines and battleships.

Upon motion of Dr. E. Vernon Hill, resolutions were adopted expressing the sense of loss felt by the chapter in the death of J. B. Wigman.

### Eastern Pennsylvania Chapter Endorses Research Bureau Plan.

Hearty endorsement to the plan of establishing a research bureau for the heating engineers' society was given by the Eastern Pennsylvania at its meeting held December 13. Among the guests of the chapter who were present in the interests of this project were J. I. Lyle, Homer Addams, Secretary C. W. Obert, and W. S. Timmis.

### Kansas City Chapter Issues Programme for Year.

A six-page folder giving the topics of its meetings for the season of 1918-1919, together with a list of officers and the names of those who have been in military service, had been issued by the Kansas City Chapter. There is also included a full list of the chapter's members and other information. Meetings of the chapter are held the first Thursday of each month.

### Automatic Bleeder Turbines.

Many power plants are called upon to furnish low-pressure steam for heating purposes, as well as electricity for power and lighting. If this steam is supplied to the mains from the boiler through a reducing valve, its expansive energy is wasted and its heating value is only slightly greater than that of ordinary exhaust steam. To eliminate this waste, the exhaust from non-condensing steam engines is often passed into the heating system. But unless the demand for steam and power coincide, the gain is small, due to the low efficiency of the engine as a power producer.

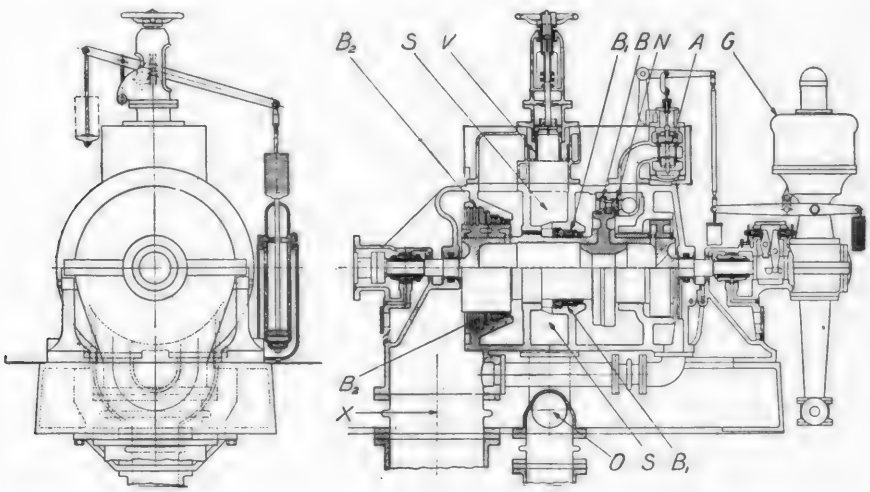
Another expedient is to supply the heating system from a receiver between the cylinders of a compound engine, but this arrangement is lacking in flexibility, since the receiver pressure varies with the power load on the engine. In addition to this, the cylinder proportions of the engine are such as to give poor efficiency unless a certain amount of steam is constantly with-

drawn from the receiver. Such a close relation between the two demands scarcely ever exists in an industrial power plant, and as soon as either varies, operating difficulties due to over or under-expansion, which will result in severe punishment to the engine, are bound to occur.

The automatic bleeder turbine is free from the foregoing disadvantages. It automatically supplies the desired amount of low-pressure steam to the heating system, at a constant pressure, and at the same time efficiently develops the required amount of electrical energy and retains all the desirable operating characteristics peculiar to turbine apparatus.

The sectional view shows the construction of the Westinghouse Bleeder turbine. Steam from the boilers enters through the admission valve A which is under control of the governor G. After suitable expansion in nozzles N it passes through the high-pressure and intermediate blading B and $B_1$, where it produces power by taking the expansive energy from the steam. At the end of the blades $B_1$, the steam reaches an annular space S from which it goes to the heating system through the outlet O. If the work done by the steam in passing through the blades is insufficient to carry the power load, the valve A will automatically open wider and more steam will pass into the turbine, raising the pressure at S. At V is a weight-loaded by-pass valve which opens when this pressure is sufficiently great and allows the excess steam to pass into the low-pressure blading, $B_2$, where its expansion is completed before it passes to the condenser through the exhaust X.

By changing the weights on the by-pass valve, the pressure on the heating system can be varied as desired, but will be maintained constant for any one setting of the weights. It is apparent that, except for changes of this kind, the operation of the machine is entirely automatic, being similar to that of any other turbine. If it is desired to produce power without passing any steam to the heating system, this may be done by closing the valve in the line leading to the heating system and taking the weights from the by-pass valve so that it will be lifted out of the steam passage. The turbine is then a simple condensing machine. Whatever the operating condition, the efficiency of the turbine as a power producer is high and is not affected by the bleeding out of steam.




CONSTRUCTION OF WESTINGHOUSE BLEEDER TURBINE.

A particularly desirable feature is that the steam so bled is free from contamination by oil of which there is none inside the turbine, and the heating mains are therefore kept clean and free from obstruction by accumulations of grease.

Bleeder turbines in capacities up to 5,000 kilowatts are in successful operation at the present time. They find extensive use, not only for heating, but also in industrial plants, such as paper mills, chemical factories, etc., where low-pressure steam is required in the processes.

## New Publications.

HYDRAULIC EXPERIMENTS WITH VALVES, ORIFICES, HOSE NOZZLES AND ORIFICE BUCKETS, by Arthur N. Talbot, Fred B. Seely, Virgil R. Flmeing and Mervin L. Enger, has been published as Bulletin No. 105 of the Engineering Experiment Station of the University of Illionis. The bulletin contains the results of four tests, one of which relates to the loss of hydraulic head in small valves. The results are given of experiments on the flow of water through 1-in. and 2-in. gate valves, 1-in. and 2-in. globe valves and 1-in. and 2-in. angle valves. The following summary is given as applying to the types tested, with valve settings ranging from one-fourth open to wide open:

(1) The loss of head caused by small valves varies as the square of the velocity in the pipe for all the valve openings; hence the lost head may be expressed as a constant times the velocity head in the pipe, $h = \frac{mv^2}{2g}$

(2) When wide open a globe valve causes more than twice as much loss of head as an angle valve of the same size, while a gate valve causes much less loss of head than either a globe or an angle valve, the velocity in the pipe being the same in the three cases.

(3) The loss of head for an angle valve is somewhat less when about three-fourths open than when wide open, the velocity in the pipe being the same in each case.

(4) The loss of head for each valve, as the valve is closed from a wide open position, varies comparatively little with the valve opening until the valve is at least one-half closed. As further closure takes place the loss of head of the globe valves and gate valves increases rapidly and is considerably larger than that of the angle valves.

(5) The form or shape of the passageways through a globe or angle valve has a large influence on the loss of head for the small valve openings. The portion of the passageways in which the form seems of greatest importance is in the exit from the valve rather than in the passageways leading to the valve disc or seat. On account of the influence of the form or shape of the valve no law giving the relation of the lost head to the diameter of the valve can be stated for valve settings less than five-eighths open. For larger valve openings than this, the lost head seems to vary approximately inversely as the diameter.

(6) The use of the lost head through a partially closed valve as a means of determining the flow can be only a very rough method of measurement unless the particular valve to be used is calibrated under service conditions. Even then the difficulty in obtaining the desired valve setting may introduce considerable uncertainty in the results.

HOW TO START A TRAINING DEPARTMENT IN A FACTORY, concluding a series of publications issued by the Section on Industrial Training Committee on Labor, Council of National Defense, has been published by the Training and Dilution Service of the Department of Labor. The text outlines the steps taken in establishing a training department for the Curtiss Aeroplane Co., in Buffalo, N. Y., and was written by Frank Lawrence Glynn, director of training for the company and now in charge of the government's Fifth Training District, which embraces eastern Pennsylvania, southern New Jersey and Delaware. Size 6 x 9 in. Pp. 24 (illustrated).

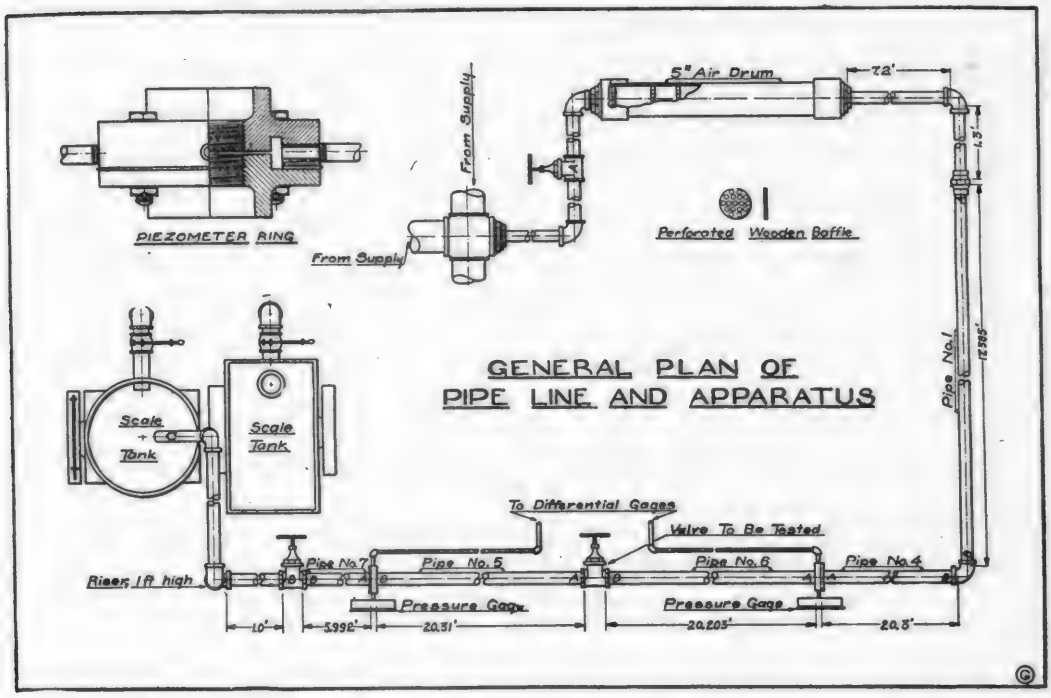
FLOW OF WATER THROUGH 1½-IN PIPE AND VALVES, by Frederick W. Greve, Jr., is the subject of Bulletin No. 1 issued by the Engineering Experiment Station of Purdue University. The experiments were made in the hydraulic laboratory of Purdue University early in 1917. The pipe used was ordinary black commercial water pipe, approximately 1 ½ in. in diameter. The relation of head lost to discharge are illustrated in the bulletin graphically on logarithmic cross-section paper. The results of the experiments on the straight pipe are given in the accompanying table. The equivalent loss of head in 100 ft. of straight pipe is illustrated in the accompanying illustration. This illustration also shows the net losses through the valves. Based on the work described in the bulletin, these conclusions are reached:

1.—The relation of loss of head to discharge in all cases can be represented by the general equation, $H_l = MQ^n$.

Loss of Head Through 1½" Straight Pipes

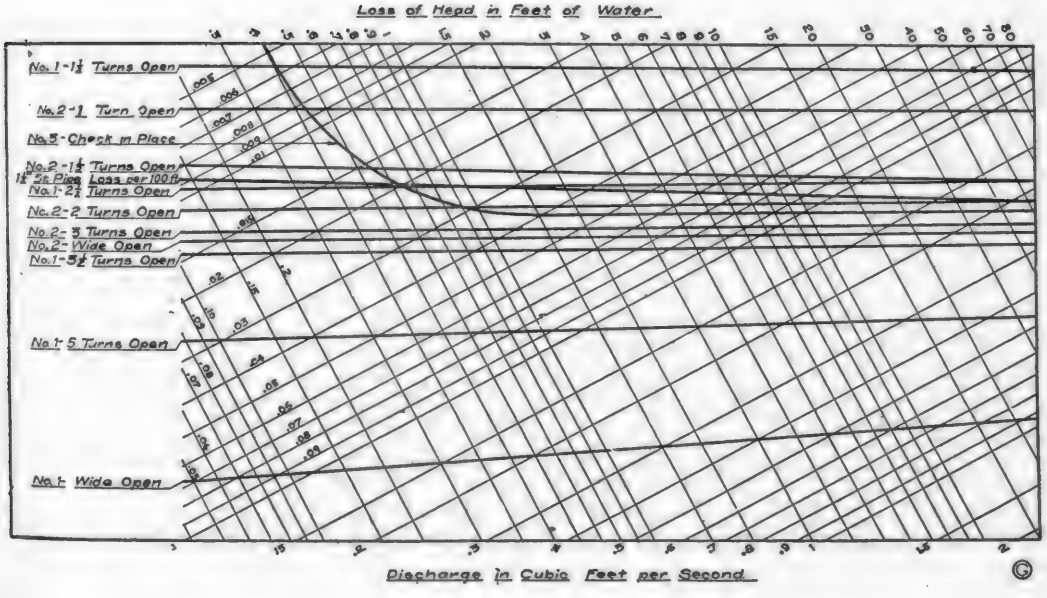
Nos. 5 and 6. Length = 40.513

| Experiment No. | Discharge cubic feet per second | Velocity feet per second | Observed Loss Head feet | Experiment No. | Discharge cubic feet per second | Velocity feet per second | Observed Loss Head feet |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 2 | .0062 | 0.44 | 0.03 | 39 | .1576 | 11.19 | 11.36 |
| 3 | .0129 | 0.91 | 0.12 | 37 | .1761 | 12.61 | 14.41 |
| 5 | .0270 | 1.92 | 0.49 | 38 | .1784 | 12.66 | 14.44 |
| 4 | .0292 | 2.07 | 0.56 | 36 | .1911 | 13.56 | 16.38 |
| 7 | .0415 | 2.95 | 1.02 | 35 | .1916 | 13.60 | 16.55 |
| 8 | .0415 | 2.95 | 1.01 | 19 | .1981 | 14.06 | 17.88 |
| 9 | .0513 | 3.64 | 1.50 | 20 | .1992 | 14.14 | 17.95 |
| 10 | .0513 | 3.64 | 1.49 | 33 | .2198 | 15.60 | 21.44 |
| 11 | .0596 | 4.23 | 1.96 | 34 | .2243 | 15.70 | 21.63 |
| 12 | .0691 | 4.26 | 1.95 | 32 | .2369 | 16.75 | 24.56 |
| 13 | .0683 | 4.85 | 2.49 | 31 | .2378 | 16.88 | 24.91 |
| 14 | .0683 | 4.85 | 2.51 | 30 | .2452 | 17.40 | 26.51 |
| 15 | .0733 | 5.34 | 3.01 | 29 | .2464 | 17.49 | 26.76 |
| 16 | .0753 | 5.34 | 3.03 | 28 | .2546 | 18.07 | 28.61 |
| 18 | .0869 | 6.17 | 3.86 | 27 | .2570 | 18.24 | 28.89 |
| 17 | .0869 | 6.17 | 3.87 | 26 | .2683 | 19.04 | 31.41 |
| 44 | .1185 | 8.41 | 6.82 | 25 | .2681 | 19.03 | 31.43 |
| 43 | .1184 | 8.40 | 6.83 | 23 | .2806 | 19.91 | 34.27 |
| 41 | .1407 | 9.99 | 9.26 | 24 | .2807 | 19.92 | 34.31 |
| 42 | .1415 | 10.04 | 9.41 | 21 | .2915 | 20.69 | 37.13 |
| 40 | .1569 | 11.07 | 11.13 | 22 | .2929 | 20.79 | 37.27 |




GENERAL PLAN OF PIPE LINE AND APPARATUS USED IN TESTING FLOW OF WATER THROUGH PIPE AND VALVES.

GATE VALVE NO.1
GLOBE VALVE NO.2
CHECK VALVE NO.3
NET LOSS OF HEAD




NET LOSS OF HEAD THROUGH STRAIGHT PIPE AND VALVES.

2.—That "M" and "n" both vary with the restriction of area to flow through the valves, decreasing with increase in values to d/D.

3.—That Weisbach's coefficients which show average values for small gate valves give values of Hl that are too small.

4.—That a gate valve causes less loss of head than a globe valve and that the losses are nearly equal for d/D=0.23.

FIRING BITUMINOUS COALS IN HOUSE-HEATING BOILERS is the subject of Technichal Paper No. 180, recently issued by the Bureau of Mines. The tests on which the recommendations are based were made on low-pressure or heating boilers that have heretofore burned anthracite coal, and are of the up-draft or surface-burning type. Among the recommendations are the following:

1. In burning bituminous coals in large house-heating boilers, the fuel bed should not be seriously disturbed until the coal has become well coked, that is, until the gassy part of the coal has been largely driven off.

2. Both caking and non-caking types of coal may be used satisfactorily in boilers of this type if properly handled. (A caking coal is one that when heated swells and forms a solid mass.)

3. The presence of a moderate proportion of screenings mixed with the lump coal causes the fresh charge of coal to heat more gradually and the emission of smoke is kept down more easily. Therefore, such a proportion of screenings is an advantage.

4. Increasing the proportion of screenings in the coal necessitates the use of a stronger draft in order to carry the same load. Smaller firing charges must also be used and more frequent attention given. The tendency of caking coals to cake is increased and this also means that the fire must have more frequent attention.

5. Frequency of cleaning the fires will be determined by the character of the coal and the rate at which it is burned, but with most coals the fires should be cleaned only once or twice in 24 hours in ordinary weather.

6. If the alternate method of firing is employed (namely, if a fresh charge of coal is made to cover only one side of the bed) the side that is left bright will continue to radiate heating to the boiler, and will also serve to ignite the combustible gases driven off from the new charge.

7. The average man is apt to poke and slice the fire much more than is actually necessary. If a caking coal is used and the caked fuel must be broken up before it is well coked, slice the fire by running a straight bar under the fuel bed and raising it slightly so as to crack the caked mass. Do not stir the bed upside down by raising the bar through the fuel bed, nor break the bed with a bar from the top.

8. If the fuel bed is covered with a charge of fresh fuel in a layer more than 5 in. thick, the new charge, unless it is very free from slack, is apt to have a smothering effect. Then the output of the boiler will be correspondingly decreased and, especially if the spreading method of firing is employed, the mass of fresh coal will usually have to be broken once or twice before the fire will pick up. Consequently, the maximum firing charge should be not much thicker than 5 inches, and for caking coal containing considerable slack, it should not be more than 4 inches thick. Of course, when a fire is to be kept banked heavier charges may be used.

9. Do not fire large lumps of coal. Break all lumps into pieces no larger than fist size.

10. Large house-heating boilers do not require an intense draft to meet any reasonable demands for heat if the fuel bed is kept in proper condition, but the draft must be properly controlled.

11. The damper regulator should work freely.

12. The doors on the front of the boiler should fit snugly in their seats; special care should be taken to prevent any material wedging between the doors and the front and thus admitting air when or where it ought to be prevented from entering.

13. Do not allow clinkers to accumulate in the fire or too great a quantity of ashes on the grates. Be careful, however, in shaking the grates not to shake through unburned fuel.

14. In ordinary or severe weather, keep an active fuel bed averaging 10 to 12 in. deep. In milder weather, the depth of active fuel may be decreased by keeping a layer of ashes on the grate under the live coals.

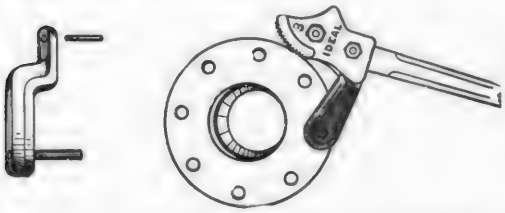
15. Keep ashes removed from the ash pit.

16. Keep flue surfaces clean by brushing at least once a week.

USE OF THE HYDROGEN-VOLATILE-MATTER RATIO IN OBTAINING THE NET VALUE OF AMERICAN COALS, by A. C. Fieldner and W. A. Selvig is discussed in an 11-page circular (Technical Paper 197) issued by the Bureau of Mines. By the use of curves given in the circular the hydrogen content of bituminous coal, semi-bituminous coal and anthracite may be estimated from the volatile matter to within 0.6%.

## New Devices.

IDEAL FLANGE ATTACHMENT, described as an improvement for use in connection with the Ideal chain wrench, whereby the scope of the work has been extended to include flanges, has been brought out by Kroeschell Bros. Co., Chicago, and is illustrated herewith. This attachment, it is stated, can




FLANGE ATTACHMENT FOR CHAIN WRENCH

quickly be applied to the wrench, in place of the chain, when the tool is to be used as a flange wrench. The special steel flange link is held in place by a loose steel pin. In this way, a grip is secured at two points of contact, gripping each edge of the flange. The wrench is thus reversible and can be used on either side of the flange. It also permits an exceptionally large range of work. The wrench, with attachment, is furnished in five sizes with capacities running from ½ in. to 3½ up to 2½ to 20 in. pipe.

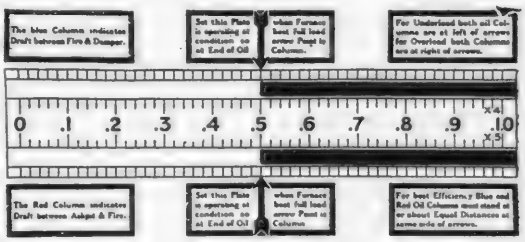
## New Design of Blonck Boiler-Efficiency Meter.

The Blonck boiler-efficiency meter, which has been on the market for five years, is now being made in a new form, although the principle of the instrument is unchanged. In the new type, the ¼-in. pipe connection between the boiler setting and the meter enter the instrument from the back, leaving the front openings in the top of the right-hand boss, over the words "damper connection" and "furnace connection," open for insertion of oil, without disturbing the piping. A light is provided at the top of the meter to illuminate the instructions on the face of the instrument.

The front consists of a heavy plate glass, lettered on the inside, giving the instructions for interpreting the indications of the meter. The instrument is also provided with an iron bracket which may be bolted to the furnace front, holding the body of the meter about 2½ in. from the hot wall of the boiler.

The moving of the sliding arrow plates is now accomplished by inserting a key rod through an opening at the left hand of the body of the meter. This key rod engages either of the sliding arrow plates permitting them to be moved to the position at which the oil columns stand for the most economical operation of the furnace and maximum combustion efficiency.

It will be noticed from the illustration




DETAIL OF METER FRONT

that the lower tube indicates the draft loss through the fire, while the upper inclined glass tube indicates the draft loss through the boiler tubes. The drafts over the fire and at the boiler side of the damper are determined for such damper position as gives a satisfactory $CO_2$ percentage in the flue gases. The Blonck meter is then constructed in accordance with these data. According to theory and also in accordance with results obtained in the latest experiments, both of the oil columns of the meter must move even with each other in order that the efficiency of combustion in the furnace may be constant in all loads.

Should one of the oil columns move in one direction and the other in the other direction or should both oil columns not move at the same rate or the same distance in the same direction, some condition has occurred in the furnace, which is impairing the efficiency of combustion. What this condition is will be determined from the concise instructions given on the illuminated front of the instrument. If the meters weer not especially constructed the oil columns would

NEW DESIGN OF BLONCK BOILER EFFICIENCY METER.

be at different points on the scale and their relative distances would be different at different loads.

In addition to the natural-draft type shown herewith, the meter is also made in a type suitable for forced-draft conditions. These meters are manufactured by W. A. Blonck & Co., combustion engineers, Chicago, Ill.

### Peace Problem of U. S. Employment Service.

Elaborate plans have been formulated by the United States Employment Service for finding work for soldiers, sailors, and civilian war workers. It is stated that during the transition from a war to peace basis, literally hundreds of thousands of munition and war workers will be temporarily out of employment, to say nothing of the demobilization of the army.

In connection with the plans of the Employment Service, a bureau will be established in every community where the returning soldier or sailor may ascertain what employment is open for him. Employers are urged to register their opportunities for employment at the central bureau. In many communities the bureau will care also for those civilians who have left their peacetime jobs to do war work.

The work in each State is under the control of the federal director of the U. S. Employment Service for the State. Each such director is responsible to the director diwherever such a board exists and of the reau in each city or town is supervised by a board of management, composed of representatives of the community labor board, wherever such a board exists and of the community council of defense, of the local branch of each organization represented on the central committee and other local organizations, a representative of labor and other representative citizens. The officers of such a board will be selected by it.

Complete details of the plan are published in the U. E. Employment Service Bulletin for December 10, 1918, 916 Sixteenth Street, N. W., Washington, D. C.

### Views of Manufacturers on the Business Outlook.

An inquiry as to the business outlook sent out by the Merchants' Association of New York, has brought responses from a large number of manufacturers in the metropolitan district in which optimism is the dominant note. Some of the manufacturers speak of the difficulty of obtaining raw materials, others refer to the shortage of vessels for exporting their products, while many express uncertainty with regard to the future relations between employers and employees. On the whole, however, the business outlook is considered large in its possibilities.

### What is Americanization?

A good definition of Americanism is given in the *Americanization Bulletin* which describes it as "Americanization is a process of education, of winning the mind and heart through instruction and enlightenment.

Americanization is not something which the government or a group of individuals may do for the foreign born or others. It is what these persons do for themselves when the opportunity is offered and they are shown the way; what they do for the country and the thing called democracy."

### Plans for Rehabilitation of Disabled Soldiers and Sailors.

Employers of labor are to have an important part in the rehabilitation of 200,000 American men disabled in the war, according to the plans of the Federal Board of Vocational Education. It is the intention of the government to assist in replacing each man, regardless of his handicap, in suitable civil employment. Employers are asked to consider the proposition from a business standpoint and not as a matter of charity.

Each case will be considered individually on its merits by experts of the Federal Board and by a physician, an employer and a representative of labor in the home district of the man who is to be trained. While it is the policy of the Federal Board to return the man to his former occupation, it can if deemed advisable train him for an entirely new trade. Courses of instruction in all agricultural, industrial, commercial and professional occupations are being provided under the jurisdiction of the Federal Board.

No attempt is being made by the government to establish special schools for the training of disabled men. The most reputable trade and vocational schools, colleges and other well-organized institutions will be utilized. In many cases the training will be given in the factory, shop or office in which the disabled man will later be employed.

All expenses of course of training, the personal living expenses of the disabled

man, and in the case of one who could not successfully follow an occupation without retraining, allowances will be paid to his dependents by the government.

Co-operation of the right kind is sought. Every employer will do well to learn his part in this great work for the disabled soldier and sailor. Inquiries should be addressed to the Federal Board for Vocational Education, Washington, D. C.

### National Federation of Building Industries Discusses Business Outlook.

Immediately following the congress of the war service committees in Atlantic City last month, the National Federation of Building Industries met to consider in detail the reconstruction era as it applies to the building industry. It was voted to continue the federation as a trade organization to stimulate building construction.

Among the projects discussed was the "Own Your Own Home" movement, which will probably be the slogan for a building campaign.

It was the consensus of opinion that the high cost of labor will not be lowered until a reduction is made in the prices of materials, or, in other words, that the high cost of living will have to be reduced before wages are lowered.

Among those present were the following:

J. T. Duryea, president Pierce, Butler & Pierce Mfg. Corporation; A. M. Maddock, president Thos. Maddock's Sons; C. V. Kellogg, president Kellogg-Mackay Co.; J. R. Steneck, President Illinois Malleable Iron Co. and also president of the Central Supply Association; Paul Blatchford, secretary Central Supply Association; L. O. Koven, president L. O. Koven & Bro.; Charles K. Foster, vice-president American Radiator Company; F. W. Herendeen, secretary Boiler and Radiator Manufacturers' Association; and C. L. Selkregg, Pittsburgh Valve & Fittings Co.

### Appeal for Near East Relief.

A campaign was opened January 12 by the American Committee for Relief in the Near East to raise $30,000,000 to relieve the situation of famine and want in the Near East. It is stated that 4,000,000 survivors of the period of massacre and starvation in this "Death Valley of the Old World" are now left homeless and helpless. Of these more than 400,000 sufferers are orphaned children. Contributions should be made payable to the American Committee for Relief in the Near East, 1 Madison Avenue, New York.

### Deaths.

WARING LENNOX DAWBARN, vice-president of the Thatcher Furnace Co., New York, died November 30 at his home in Hartsdale, N. Y., of pneumonia. He was 30 years old. Mr. Dawbarn had had a remarkable career. He entered the employ of the Thatcher Furnace Company upon his graduation from Princeton, first taking up work as an apprentice core maker. At the end of three years he had become superintendent of the foundry and factory. Shortly thereafter he was made secretary of the company and at the time of his death was a director and vice-president, having been associated with the company eleven years. He had become a well-known figure in the furnace and boiler industries and in association work. Mr. Dawbarn is survived by a widow and two children.

CAPTAIN CLARENCE J. SODEMANN, a son of Chris. W. Sodemann of the Sodemann Heat & Power Co., St. Louis, Mo., who was serving with the 138th Infantry in France, met his death in the Argonne forest September 29 while leading his company in an attack on the Germans. Captain Sodemann was 24 years old and had served with distinction in the battles in the Vosges Mountains.

E. L. STRAUSS, president of the Central Brass Mfg. Co., Cleveland, O., and at the time of his death president of the National Association of Brass Manufacturers, died of pneumonia at his home in Cleveland, December 11. He was 37 years old.

H. T. CHILDS, treasurer of the Walker & Pratt Mfg. Co., Boston, Mass., died at his home in Malden, Mass., December 11. He had been associated with the company 33 years.

LIEUTENANT FREDERICK W. WINSLOW, president of the Robert-Winslow Co., Cleveland, O., manufacturers' agents, died of influenza December 13 at Camp Humphrey, Va. Mr. Winslow entered the service some time ago and obtained a commission with the United States Engineers.

H. W. Johns-Manville Co., New York, announces with deep sorrow, the death of Charles F. Simms, for many years manager of its Omaha office. Mr. Simms was associated with the company for nearly thirty years. The company has appointed S. E. Cole to succeed Mr. Simms in the management of the Omaha office.

## PROPER TEMPERATURES FOR VARIOUS ROOMS.

| *Rooms.* | *Degrees F.* |
|---|---|
| Bath Rooms | 70 to 85 |
| Boiler Shops | 50 to 60 |
| Churches | 65 |
| Cooling Rooms (Bath Houses) | 59 |
| Entrance Halls | 54–60 |
| Factories | 65 |
| Foundries | 50–60 |
| Gymnasiums | 60 |
| Homes for Aged | 80 |
| Hospitals | 72–75 |
| Hot Air Baths (Bath Houses) | 140 |
| Hot Rooms (Bath Houses) | 77 |
| Lecture Halls | 60–64 |
| Living Rooms | 68 |
| Massage Rooms (Bath Houses) | 77 |
| Machine Shops | 60–65 |
| Offices | 68 |
| Operating Rooms | 70–90 |
| Paint Shops | 80 |
| Prisons—Day Confinement | 64 |
| Prisons—Night Confinement | 50 |
| Public Buildings | 68–72 |
| Schools | 70 |
| Shops | 65 |
| Sick Rooms | 72 |
| Steam Baths (Bath Houses) | 113 |
| Swimming Halls | 68 |
| Vestibules | 54–60 |
| Warm Air Baths (Bath Houses) | 122 |

## EXHALED AIR AND DIFFUSED BODY HEAT.

The following table gives the composition of pure air and of respired air:

| | PURE AIR | RESPIRED AIR |
|---|---|---|
| Oxygen | 20.35 | 16.2 |
| Nitrogen | 78.10 | 75.4 |
| Carbon Dioxide | 0.30 to 0.04 | 3.4 |
| Water Vapor | 1.5 (variable) | 5. |

As the respired air is immediately diffused in the air of the room, it cannot be directly removed, but only diluted till it ceases to be harmful. There is, therefore, no definite standard of purity, and any line drawn between good and poor ventilation is arbitrary. Pure air contans 3 to 4 parts of carbon dioxide in 10,000. With an increase to 11 parts in 10,000, the air becomes noticeably oppressive, while an increase of 3 parts or a total of 6 to 7 parts is scarcely noticeable.

The physical principles involved in heating buildings are much more complex than is usually supposed, and exhibit an admirable nicety in the balancing of forces. We have first of all to consider the heat generated by the human body, and the method of its disposal, which are important conditions determining the most desirable room temperatures, and in densely peopled buildings, largely determining the result of vital processes dependent in part upon the activity of the individual.

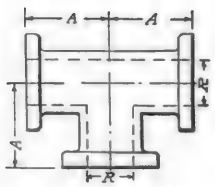
The following shows the amount of bodily heat diffused:

| | B. T. U. PER HOUR |
|---|---|
| Child six years old | 240 |
| Adult at rest | 380 |
| Adult at work | 500 |
| Man 30 years old in an atmosphere with a temperature 68° F | 440 |
| The same, in atmosphere of 31° F | 600 |
| Woman 32 years old | 480 |
| Adult in old age | 360 |

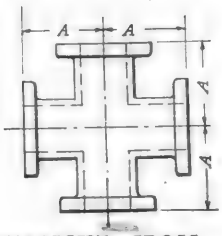
The amount of heat in B. T. U. usually assumed as given off per person per hour in an atmosphere of 70° F. is 400 for adults and 200 for children. These are the figures generally used when the heating effect of the occupants of assembly halls or auditoriums is taken into account.

(BUFFALO FORGE CO.)

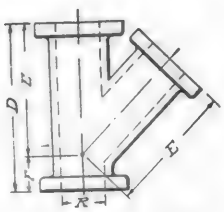
## 1915 STANDARD EXTRA-HEAVY STRAIGHT TEES, CROSSES AND LATERALS, FLANGED.




STRAIGHT TEE.




STRAIGHT CROSS.

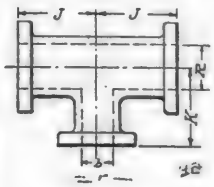



STRAIGHT LATERAL.

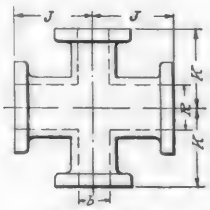
### 250 LBS. WORKING PRESSURE

| Size, In. Diam. | Dimensions. In. | | | Flanges | |
|---|---|---|---|---|---|
| R | A | D | E | Diam. In. | Thickness, In. |
| 1 | 4 | 8½ | 6½ | 4½ | 11/16 |
| 1¼ | 4¼ | 9½ | 7¼ | 5 | ¾ |
| 1½ | 4½ | 11 | 8½ | 6 | 13/16 |
| 2 | 5 | 11½ | 9 | 6½ | ⅞ |
| 2½ | 5½ | 13 | 10½ | 7½ | 1 |
| 3 | 6 | 14 | 11 | 8¼ | 1 ⅛ |
| 3½ | 6½ | 15½ | 12½ | 9 | 1 ⅜ |
| 4 | 7 | 16½ | 13½ | 10 | 1 ¼ |
| 4½ | 7½ | 18 | 14½ | 10½ | 1 5/16 |
| 5 | 8 | 18½ | 15 | 11 | 1 ⅜ |
| 6 | 8½ | 21½ | 17½ | 12½ | 1 7/16 |
| 7 | 9 | 23½ | 19 | 14 | 1 ½ |
| 8 | 10 | 25½ | 20½ | 15 | 1 ⅝ |
| 9 | 10½ | 27½ | 22½ | 16¼ | 1 ¾ |
| 10 | 11½ | 29½ | 24 | 17½ | 1 ⅞ |
| 12 | 13 | 33½ | 27½ | 20½ | 2 |
| 14 | 15 | 37½ | 31 | 23 | 2 ⅛ |
| 15 | 15½ | 39½ | 33 | 24½ | 2 3/16 |
| 16 | 16½ | 42 | 34½ | 25½ | 2 ¼ |
| 18 | 18 | 45½ | 37½ | 28 | 2 ⅜ |
| 20 | 19½ | 49 | 40½ | 30½ | 2 ½ |
| 22 | 20½ | 53 | 43½ | 33 | 2 ⅝ |
| 24 | 22½ | 57½ | 47½ | 36 | 2 ¾ |
| 26 | 24 | — | — | 38¼ | 2 13/16 |
| 28 | 26 | — | — | 40¾ | 2 15/16 |
| 30 | 27½ | — | — | 43 | 3 |
| 32 | 29 | — | — | 45¼ | 3 ⅛ |
| 34 | 30½ | — | — | 47½ | 3 ¼ |
| 36 | 32½ | — | — | 50 | 3 ⅜ |
| 38 | 34 | — | — | 52¼ | 3 7/16 |
| 40 | 35½ | — | — | 54½ | 3 9/16 |

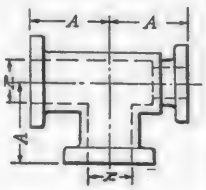
# 1915 STANDARD EXTRA-HEAVY BULL-HEAD REDUCING TEES AND CROSSES, FLANGED.



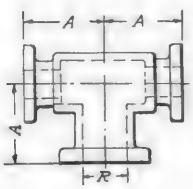
Reducing Tee



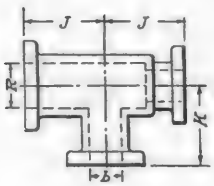
Reducing Cross

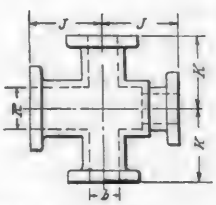


Reducing-on-Run Tee



Bullhead Tee.





Reducing-on-Run and Branch Tee and Cross.

## 250 IBS. WORKING PRESSURE

| Size, In. Diam. Run | Branch | Dimensions, In. J | K |
|---|---|---|---|
| 1 | | | |
| 1¼ | 1 or less | 4¼ | 4¼ |
| 1½ | 1¼ or less | 4½ | 4½ |
| 2 | 1½ or less | 5 | 5 |
| 2½ | 2 or less | 5½ | 5½ |
| 3 | 2½ or less | 6 | 6 |
| 3½ | 3 or less | 6½ | 6½ |
| 4 | 3½ or less | 7 | 7 |
| 4½ | 4 or less | 7½ | 7½ |
| 5 | 4½ or less | 8 | 8 |
| 6 | 5 or less | 8½ | 8½ |
| 7 | 6 or less | 9 | 9 |
| 8 | 7 or less | 10 | 10 |
| 9 | 8 or less | 10½ | 10½ |
| 10 | 9 or less | 11½ | 11½ |
| 12 | 10 or less | 13 | 13 |
| 14 | 12 or less | 15 | 15 |
| 15 | 14 or less | 15½ | 15½ |
| 16 | 15 or less | 16½ | 16½ |
| 18 | 18 to 14 inc. | 18 | 18 |
| 20 | 20 to 15 inc. | 19½ | 19½ |
| 22 | 22 to 16 inc. | 20½ | 20½ |
| 24 | 24 to 18 inc. | 22½ | 22½ |
| 26 | 26 to 20 inc. | 24 | 24 |
| 28 | 28 to 20 inc. | 26 | 26 |
| 30 | 30 to 22 inc. | 27½ | 27½ |
| 32 | 32 to 22 inc. | 29 | 29 |
| 34 | 34 to 24 inc. | 30½ | 30½ |
| 36 | 36 to 26 inc. | 32½ | 32½ |
| 38 | 38 to 26 inc. | 34 | 34 |
| 40 | 40 to 28 inc. | 35½ | 35½ |

NOTE.—A reduction in size *on the run* does not affect the dimensions but branch outlets of smaller size than those listed below will reduce the dimensions of fittings 18 in. or over in size.

| Branch | J | K |
|---|---|---|
| 12 or less | 14 | 17 |
| 14 or less | 15½ | 18½ |
| 15 or less | 16½ | 20 |
| 16 or less | 17 | 21½ |
| 18 or less | 19 | 23 |
| 18 or less | 19 | 24 |
| 20 or less | 20½ | 25½ |
| 20 or less | 20½ | 26½ |
| 22 or less | 22 | 28 |
| 24 or less | 23½ | 29½ |
| 24 or less | 23½ | 30½ |
| 26 or less | 25 | 31½ |

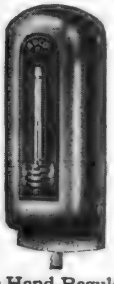
| Flanges Diam. In. | Thickness In. |
|---|---|
| 4½ | 11/16 |
| 5 | ¾ |
| 6 | 13/16 |
| 6½ | ⅞ |
| 7½ | 1 |
| 8¼ | 1 ⅛ |
| 9 | 1 3/16 |
| 10 | 1 ¼ |
| 10½ | 1 5/16 |
| 11 | 1 3/8 |
| 12½ | 1 7/16 |
| 14 | 1 ½ |
| 15 | 1 ⅝ |
| 16¼ | 1 ¾ |
| 17½ | 1 ⅞ |
| 20½ | 2 |
| 23 | 2 ⅛ |
| 24½ | 3 3/16 |
| 25½ | 2 ¼ |
| 28 | 2 ⅜ |
| 30½ | 2 ½ |
| 33 | 2 ⅝ |
| 36 | 2 ¾ |
| 38¼ | 2 13/16 |
| 40¾ | 2 15/16 |
| 43 | 3 |
| 45¼ | 3 ⅛ |
| 47½ | 3 ¼ |
| 50 | 3 ⅜ |
| 25¼ | 3 7/16 |
| 54½ | 3 9/16 |

# FUEL SAVING Assured by ARCO Temperature Regulators

In the selling of Arco Temperature Regulators the Heating Trade has the benefit of widespread publicity and all the arguments of the Fuel Conservation Bureau. These regulators will enable the householder to keep the temperature at 68° with the minimum of attention and the smallest fuel consumption. Easily installed on any heating systems.

The 8-Day Automatic Model

**8-Day Model Arco Temperature Regulator** can be set to close the drafts at any desired time in the evening and open them again at any desired time in the morning without attention other than to wind the clock once a week and the motor at less frequent intervals —or can be operated as a plain Thermostat adjustable for temperatures from 55 to 85 degrees.



The Hand Regulated Model

**1-Day Model Arco Temperature Regulator** has a time release which can be set to open the drafts at any desired time in the morning —otherwise adjustable for temperatures from 55 to 85 degrees.

**Plain Model Arco Temperature Regulator.** No clock—hand adjustable—will keep temperature uniform at any desired degree, from 55 to 85.

*See demonstration at nearest local Branch or Sales Office and send for instructive booklets*

## AMERICAN RADIATOR COMPANY

Branches and Sales Offices in most large cities

# TRADE AND MISCELLANEOUS NOTES

### Coming Events.

**January 28-30, 1919.**—Annual meeting of The American Society of Heating and Ventilating Engineers. Headquarters at the Engineering Societies Building, New York.

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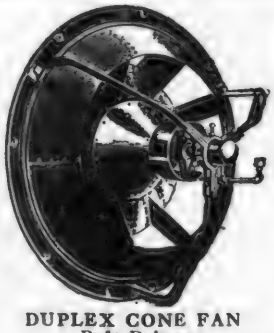
### Miscellaneous Notes.

**Watertown, N. Y.**—It is announced that Madison Barracks is not to be given up as an army hospital. John J. Turner & Sons, Amsterdam, have the contract for remodeling the buildings and installing a new heating system to adopt them for hospital use.

**Chicago, Ill.**—Among the Chicago theatres that failed to live up to the requirements of the Department of Health in connection with their ventilation, during the recent influenza epidemic, was the Garrick Theatre. This theatre was threatened with closure and several smaller playhouses were closed by the Department of Health until the owners complied with the ventilation rules.

**Centralia, Ill.**—During the influenza epidemic a special deputy health officer was appointed to see that all public places were kept properly ventilated, also that people found sneezing and coughing or had colds or looked ill, were not permitted to mingle in crowds. In this connection City Physician Armstrong announced that "all church and theatre goers are asked to wear plenty of warm clothing in order to keep warm in the ventilation which will be enforced. If the ventilation is not freely and properly given, the offending buildings will be immediately closed. Churches must ventilate during the afternoon on Saturdays and sufficient windows

DUPLEX CONE FAN
Belt Driven

HOWARD & MORSE
45 FULTON ST., N. Y.
Ventilating Engineers and Contractors
MANUFACTURERS OF
BLACKMAN and DUPLEX CONE FANS
which are installed by us complete with **Motors, Duct Work** and **Wiring.**

**Aligning, Rigging** and **Hoisting** done, with labor thoroughly qualified from long experience.

We make a specialty of **Kitchen Exhaust** work. Prominent buildings, hospitals, theatres, and private residences are among our many and recent installations.

The **Duplex Cone** Fans are semi-conoidal fans, made especially to operate against pressure in duct systems.

The **Blackman** Fans are used for fresh air delivery and in duct systems, when no great pressure is involved.

You can have the advantage of our experience.
SEND FOR CATALOGUE

BLACKMAN FAN
Direct Connected to Motor

be kept open during services to maintain an abundance of fresh air at all times. Theatres must be ventilated in a similar way between and during performances. All public meetings must be conducted with ample ventilation so that the air circulates freely. Stores must be ventilated and kept open as far as possible within the limits of comfort and the same applies to the street cars."

**George H. Gibson Co.**, New York, "an organization of engineering and editorial specialists engaged in the commercial development of mechanical business and their products," announces the addition to its staff of M. William Ehrlich, who has been engaged on war service at the U. S. Government Explosives Plant, at Nitro, W. Va., as engineer on progress for the Thompson-Starrett Co.

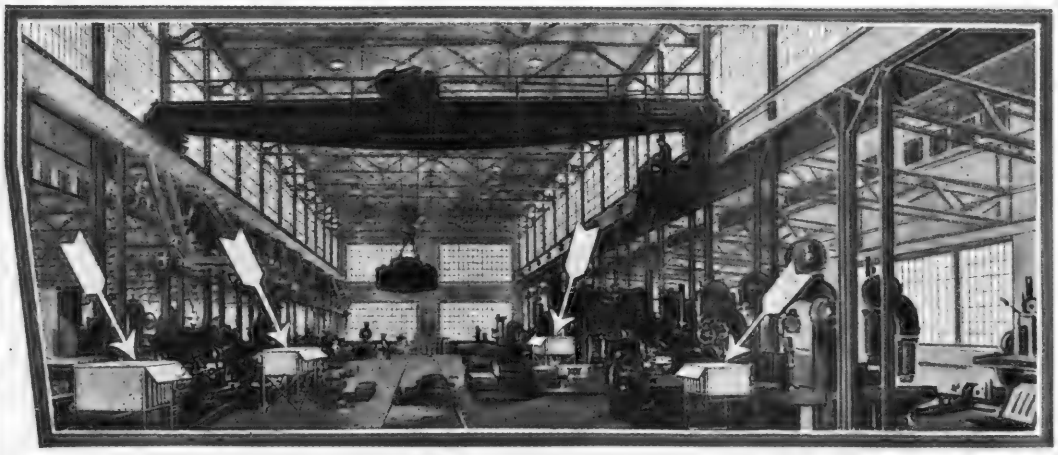
**Chicago, Ill.**—According to recent reports from architects and engineers, as reported by *Domestic Engineering*, of Chicago, the total contemplated building activity for Chicago is divided approximately as follows: Industrial and office buildings, $128,033,000; apartment houses, hotels and residences, $1,-929,000; institutional, church and municipal buildings, $14,085,000, representing a grand total of $144,047,000.

**Sterling Engineering Co.**, Milwaukee,

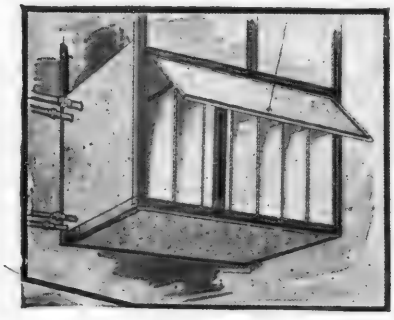

# ILGAIR UNIT HEATERS

**—heat open spaces with great economy**

**Easily installed—speed up heating—provide flexible control—prevent heat loss.**
**First cost and power requirements surprisingly low.**
**Now used in many of America's leading industrial plants.**



**Floor type installed in modern manufacturing plant**



**Ceiling Suspension Type**

**ILGAIR UNIT HEATERS**
**effectively used to "bolster up" poor systems.**

**Supply additional heat for "local cold spots."**

HIGH EFFICIENCY TRADE ILG MARK VENTILATING MACHINERY

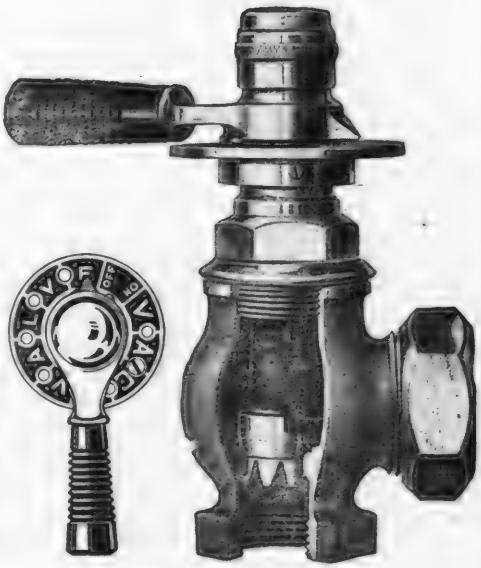
**Write for proposition**

**ILG ELECTRIC VENTILATING CO.**
**158 Whiting St., Chicago, Ill.**
**Branches in all large cities**

# DETROIT PACKLESS RADIATOR VALVES

## The Correct Radiator Valve for Vapor Heating

The Detroit Packless Vacu Valve is a Graduated Valve for Vapor and Vacuum Systems of Heating. The dial plate is provided with a series of holes and a movable pin. This pin acts as a stop for the handle pointer and is inserted in the hole in the dial nearest the point at which the valve, when opened, admits only sufficient vapor or steam to fully supply the radiator.




**DETROIT PACKLESS**
**Vacu Valve showing Dial Plate and Lever Handle**

**Booklet VP-1 Gladly Sent Upon Request**

**DETROIT LUBRICATOR COMPANY**
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO

**LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD**

Wis., is the new title adopted by the Heating & Power Equipment Company, which has just increased its capital stock from $15,000 to $50,000.

**Russell T. Gray,** Chicago, Ill., advertising engineer, announces the addition to his staff of W. F. Keckeisen, formerly advertising manager of the International Filter Company and previously associated with the Federal Sign Company.

**National Association of Brass Manufacturers** held its annual meeting in New York, at the Hotel Astor, December 11 and 12. Immediately previous to the meeting the sad news was received that the president of the organization, E. L. Strauss, of Cleveland, had died of pneumonia.

Following are the officers elected: President, Harry A. Speakman, Speakman Co., Wilmington, Del.; first vice-president, H. W. Gillette, Standard Sanitary Mfg. Co., Pittsburgh, Pa.; second vice-president, Raymond Deutsch, Monarch Brass Co., Cleveland, O.; trustees: J. C. Sanders, of American Foundry & Mfg. Co., St. Louis, Mo.; M. J. Koblitz, Corcoran Brass Mfg. Co., Cleveland, O.; Wilson Carey, McShant Bell Foundry Co., Baltimore, Md.; Adolph Mueller, H. Mueller Mfg. Co., Decatur, Ill.; R. H. Smith, E. Stebbins Mfg. Co., Springfield, Mass.; and L. A. Cornelius, Wolverine Brass Works, Grand Rapids, Mich.

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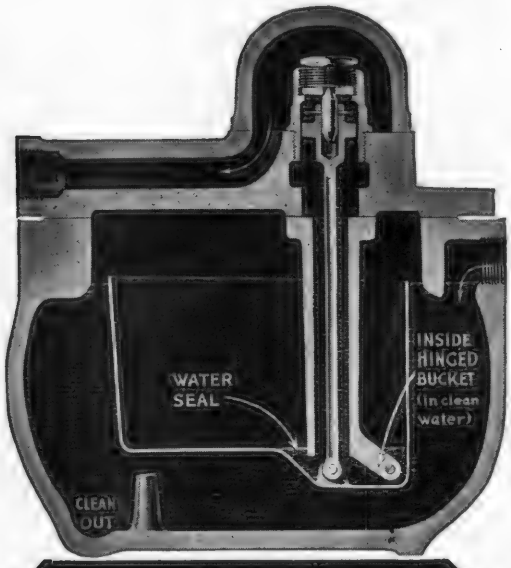
### Manufacturers' Notes.

**H. W. Johns-Manville Co.,** New York, has purchased a site in Waukegan, Ill., of approximately 255 acres on which the company will build a plant to contain about 1,250,000 sq. ft. of floor space and giving employment to over 3,000 people. The new plant will be a duplicate of the company's plant at Manville, N. J., and will be devoted largely to the manufacture of pipe and boiler covering and other asbestos and magnesia products.


## Catching Dollars with a Trap

## THE SWARTWOUT *Hydromatic* Trap

TRADE-MARK

**will catch and save the dollars that would otherwise go to waste.**

**When coal is high-priced and hard to get at any price, the little, over-looked wastes of our former "easy-going" days must be stopped.**

**The Swartwout Hydromatic Trap will positively prevent any waste of steam at your heaters or steam lines. Its action is certain—effectual. It prevents that wasteful drizzle that is constantly nibbling at your coal pile.**

**Swartwout Hydromatic Traps will pay big dividends—in many cases they have paid for themselves in one month.**

**Write today and find out how they will help you to conserve coal. Full information and catalog—free.**

**The Ohio Blower Co.**

**9211 Detroit Ave. Cleveland, Ohio.**

## The "Curve" of Humidity almost a "Straight Line"

During a recent excessive hot spell a test was made at Holyoke, Massachusetts, in a mill equipped with Carrier System of Humidifying with Automatic Control. Humidity varied only between 63 and 67 per cent and when plotted the "curve" was practically a "straight line."

The Carrier organization will be glad to co-operate with Heating and Ventilating Engineers.

**Carrier Engineering Corporation**

**39 Cortlandt Street, New York**

**Boston Philadelphia Buffalo Chicago**

89

**Richardson & Boynton,** New York, has appointed Henry L. Anness as manager of the company's Boston branch, with headquarters at 17-19 Farnsworth Street, Boston. Mr. Anness was for many years in charge of the boiler department at the New York offices of the company where his figure had become familiar to thousands of the company's patrons.

**American Pressweld Radiator Corporation,** Detroit, Mich., announces the opening of a branch office in Buffalo, N. Y., at 582 Ellicott Square. J. A. Sullivan is in charge.

**Ohio Brass Co.,** Mansfield, O., has moved its New York office to 1781 Hudson Terminal, 50 Church Street.

**McNab & Harlin Mfg. Co.,** Paterson, N. J., is building several additions to its factory in Paterson. The work will cost $250,000.

**Bicalky Fan Co.,** Buffalo, N. Y., manufacturers of the Bi-Multi line of fans and blowers, and Bi-cal-ky ventilators,etc., which was recently dissolved as a corporation, has been taken over, with its entire assets and liabilities, by C. H. Bicalky. Mr. Bicalky announces that the business will be conducted by him in the same way as in the past and that, under the new arrangement, the assets are considerably more than they were as a corporation.

# Your Next Heating Estimate

In making up your next heating bid, enter this item—"Johns-Manville Radiator Traps"—and in your cost column, right opposite, enter "Lower Cost"—then add this note—"*No expense after installation.*"

Before this better and most simple Radiator Trap was made, *finishing-up* details took too long. That meant real money loss. Profit dwindled as troubles increased. But now—with this three-piece trap—only a body, cap and hollow ball, when you finish a job—you're done. Because it cannot leak, or bind, on either air or steam. And it is fool-proof and armor-plated against meddling fingers. Self-adjustable, it is mechanically perfect in design as well as in action.

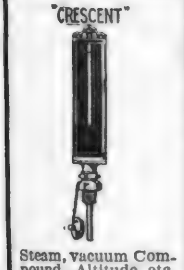
There are two profits coming to you—one on the selling price and one on installation. Our nearest branch will mail you a copy of our Steam Trap bulletin if you request it.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories—Branches in 63 Large Cities

JOHNS-MANVILLE SERVICE COVERS THE CONTINENT

# Johns-Manville Radiator Trap

# If You Have Not a Set of Our Catalogs, Get It Today




Steam, Vacuum Compound, Altitude, etc.

Thermometers all for applications

It is more than a catalog—it is a text book on Instruments for Indicating and Reading Pressure, Vacuum Draft, Temperature, etc.

**Write for Special Catalog Set HV Today**

**The Schaeffer & Budenberg Mfg. Co.**
**BROOKLYN, N. Y.**

Chicago Pittsburgh Washington
St. Louis Philadelphia Los Angeles

**Also many other Allied Instruments, Gauge Boards and Complete Equipment**

### Central Station Heating Notes.

**Colorado Springs, Colo.**—It is probable that the county will be obliged to install its own heating plant as a result of the refusal of the Colorado Springs Light, Heat & Power Company to renew its contract for heating the county buildings. The company stated that it would be impossible to furnish heat beyond the time stipulated in the contract without a financial loss. It is estimated that a separate heating plant will cost $35,000.

**Springfield, Ill.**—At hearings held before the State utilities commission on the petition of the Springfield Gas & Electric Company for a permanent increase in its heating rates, it was brought out that the patrons of the company are paying nearly twice as much as last year for heating service. The original petition to increase hot water and steam heating rates in Springfield was filed some time ago and an increased temporary rate, to be in effect this winter, was allowed by the commission. Further hearings were to be held before a decision was announced.

**Kansas City, Mo.**—A typical illustration


# PIPE BENDING

## MARINE EQUIPMENT AND REPAIR WORK
## HEATING AND VENTILATING

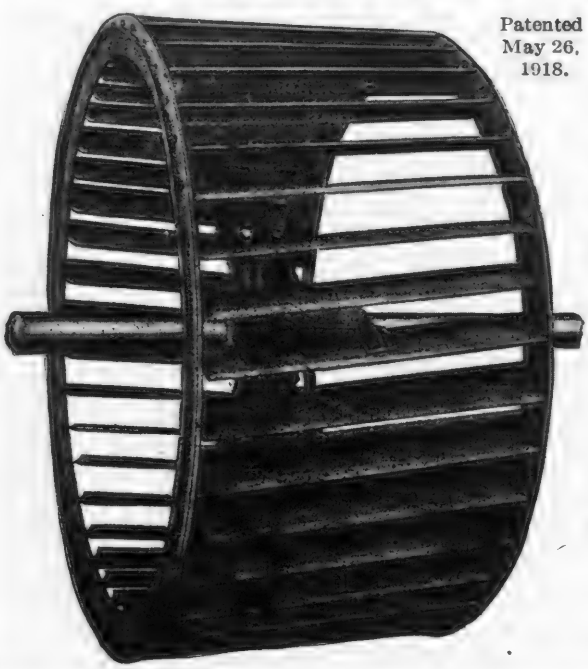
**THE OHIO HEATING AND PIPE BENDING CO.**

**Main Office and Factory, 1061-63 West 11th Street, Cleveland, Ohio**

SOLE AGENTS FOR

**F. J. Nice Oil and Combination Oil and Gas Burners**

THE NEW IMPROVED **Cycloidal Multivane Wheel**



Patented May 26, 1918.

**For Heating and Ventilating**

The vanes are curved forward, and set at an angle to the shaft, (patented feature) allowing uniform, unrestricted flow of air across entire width of wheel.

***Highest Efficiency***

**Noiseless and Durable**

**Write for further details**

**Garden City Fan Co.**

Est. 1879

**CHICAGO, ILL.**

**Eastern Representatives:**
**L. J. WING MFG. CO., New York**

Sirocco"

TRADE MARK

# Speeds Up Production

In these days of rush work, with everything strained to the limit, fresh pure air for the factory is of vital importance.

The Sirocco System of Heating and Ventilating is used by many of America's best known and most successful manufacturers.

The view above shows an installation in a factory noted for its production and efficiency methods.

In the "dog days" of summer the Sirocco System is invaluable in keeping the factory workers fresh and fit by supplying the proper amount of fresh, pure air to every nook and corner.

Let us tell you more about Sirocco for your factory—Ask for Bulletin No. 270.

## American Blower Company

DETROIT, MICHIGAN

BRANCHES IN ALL PRINCIPAL CITIES

of the difficulties being experienced by central station heating companies in securing adequate rates is given in the case of the Kansas City Heating Company. Last year the utilities commission established a test rate for this company to run from October to October. The company claimed that this rate was confiscatory and a petition is before the commission for a higher rate. The scale the commission established was lower than the company's charge and many consumers have sued for a rebate. Some criticism has been made by consumers of the "waiver" they are asked to sign but which the heating company claims is to prevent litigation when the new rates are allowed. The waiver reads as follows: "In making application for heat, I desire to advise that I know that your ability to supply is limited in quantity, and that the rates fixed by the public service commission are unreasonably low and confiscatory in their nature and character. It is not my purpose to involve the company in litigation. I believe the company should receive just compensation for services rendered. I do not believe the rates should be confiscatory. If you can comply with my request for heat I certainly shall be quite willing to compensate the company for the reasonable value thereof."

## New Incorporations.

**General Heating Corporation of America,** New York, capital $150,000, to manufacture oil heaters, burners, etc. Incorporators: H. G. Collier, 1472 Broadway; B. D. Lorenz, Brooklyn; and S. L. Wentz, East Orange, N. J.

**Dew Valve Co.,** New York, capital $50,000, to manufacture steam valves, etc. Incorporators: M. H. Cooley, 317 West 119th St.; A. L. Wright, 128 Parkside Ave., New York; and T. F. Peterson, 226 East Third St., Brooklyn.

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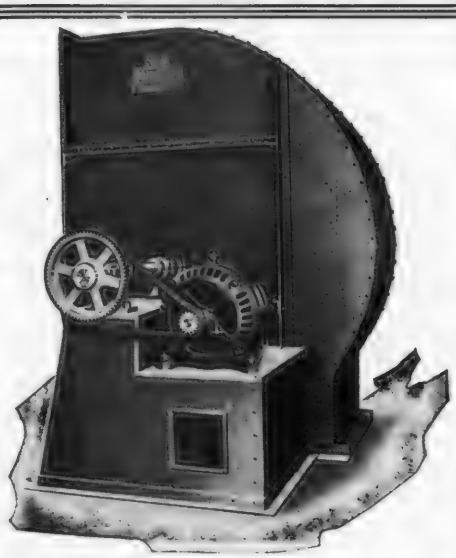

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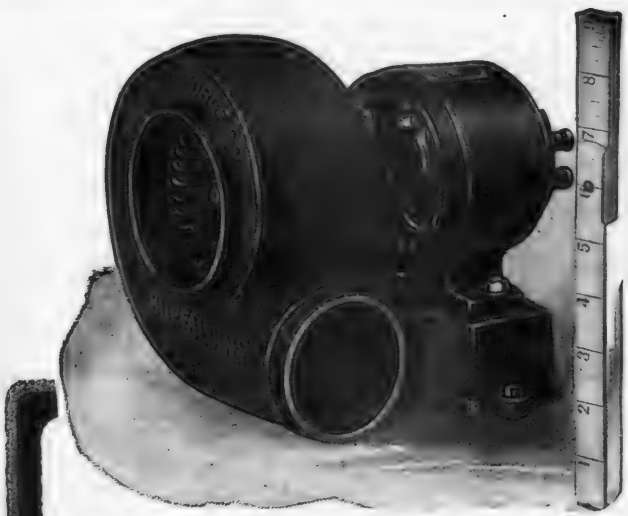

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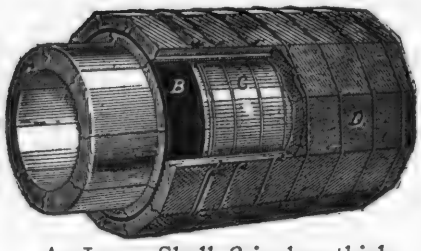


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### Employment Bureau for Engineers.

A central bureau for placing engineers in touch with available positions has been formed by the Engineering Council. It is known as the Engineering Societies' Employment Bureau and his headquarters in the Engineering Societies Building, 29 West 39th Street, New York. The bureau which is under the direction of Walter V. Brown acting as secretary, takes over the work done in this connection by the member engineering societies and deals especially with men in the service who are returning to civil life.

### Organization of "Associated General Contractors of America."

A significant step in the reconstruction movement is the organization recently of the Associated General Contractors of America. The general offices of the association will be located in Chicago, with possibly temporary headquarters in Washington. D. A. Garber, of New York, is the organization's first president. A platform was adopted by the convention covering the matters of ethics, mutual aid, co-operation with other associations, protection and proper publicity. By mutual aid, it was stated, is meant the exchange of information concerning proper cost accounting, reliable estimating, fair and reasonable allowances for depreciation of plant, conditions covering rentals, and terms as applied to equipment, etc. By co-operation with other associations, the Associated General Contractors plan to "maintain contact with commercial, engineering, architectural or other organizations."

"Protection," it is stated, "is often needed and should be furnished individual members against conditions arising from unfair legislation, bidding conditions, competition, specifications, plans, contracts, supervision and unfair labor conditions.

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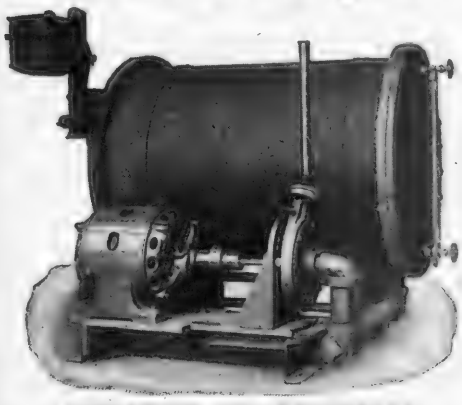

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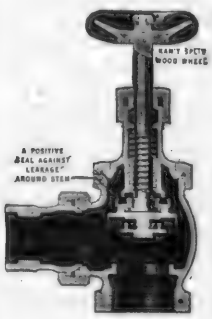


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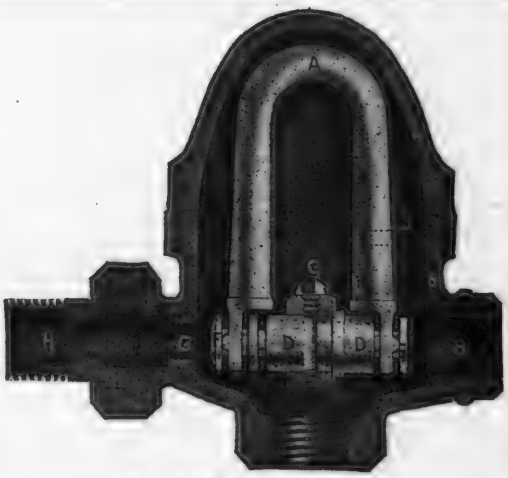


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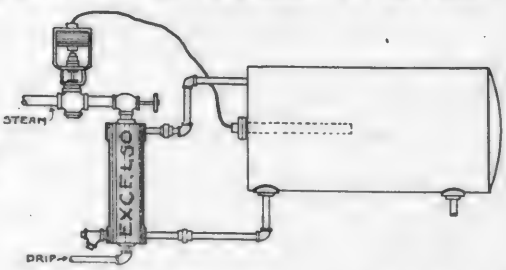


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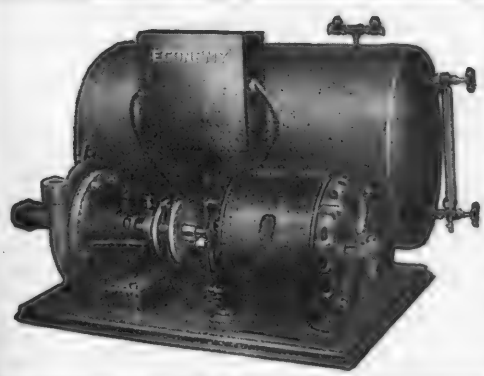


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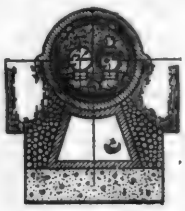

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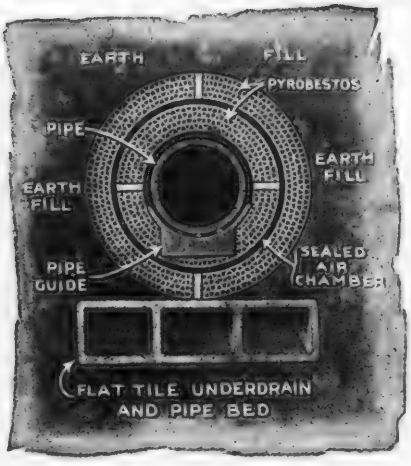


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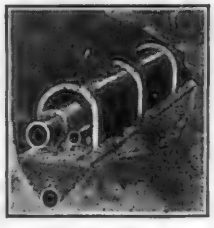

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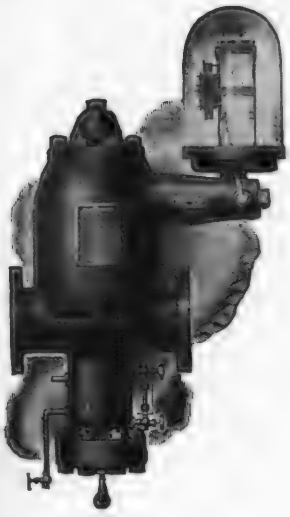

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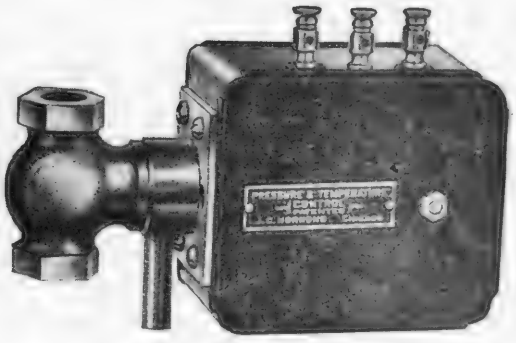

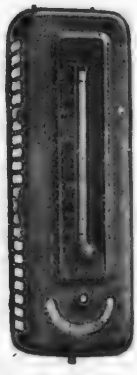

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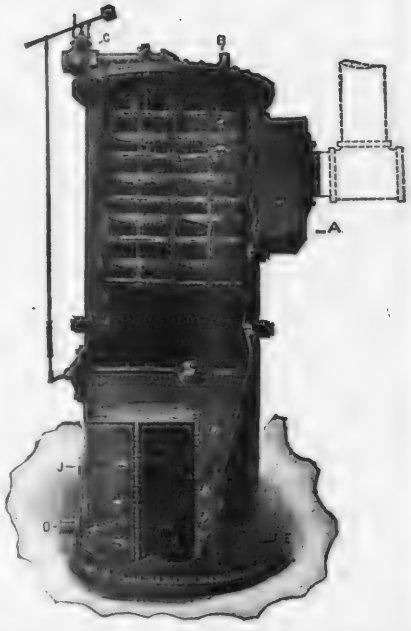


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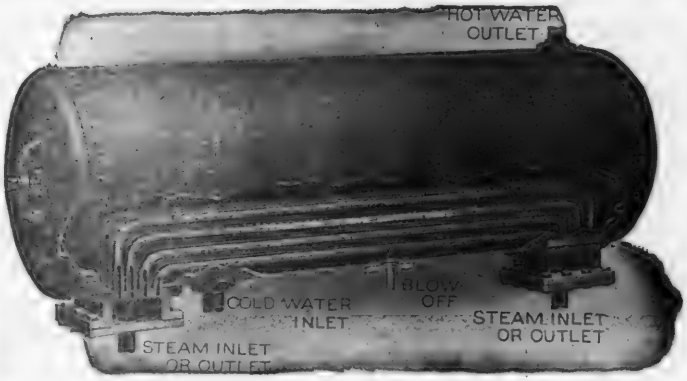


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The individual requirements of each installation are considered before we make any recommendation as to the type or capacity of heater to be used. This analysis of local conditions enables us to determine whether storage capacity is desirable and, if so, to properly proportion it with the heating service to insure ***the maximum amount of hot water in minimum length of time.***

***Send for our new catalogue.***

**Patterson-Kelley Co., 23 Dye Street, New York**

**Representatives in all Principle Cities.**

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# ROSS Water Service Heater

**The ROSS Multi-Head Heater is of the multi-pass type, designed and constructed to most effectively transmit heat from one liquid or elastic fluid to another.**

**Your requirements given prompt attention.**

**ROSS HEATER & MFG. CO., Inc.**
**Buffalo, N. Y., U. S. A.**

### Central Station Heating Notes.

**Colorado Springs, Colo.**—It is probable that the county will be obliged to install its own heating plant as a result of the refusal of the Colorado Springs Light, Heat & Power Company to renew its contract for heating the county buildings. The company stated that it would be impossible to furnish heat beyond the time stipulated in the contract without a financial loss. It is estimated that a separate heating plant will cost $35,000.

**Springfield, Ill.**—At hearings held before the State utilities commission on the petition of the Springfield Gas & Electric Company for a permanent increase in its heating rates, it was brought out that the patrons of the company are paying nearly twice as much as last year for heating service. The original petition to increase hot water and steam heating rates in Springfield was filed some time ago and an increased temporary rate, to be in effect this winter, was allowed by the commission. Further hearings were to be held before a decision was announced.

**Kansas City, Mo.**—A typical illustration


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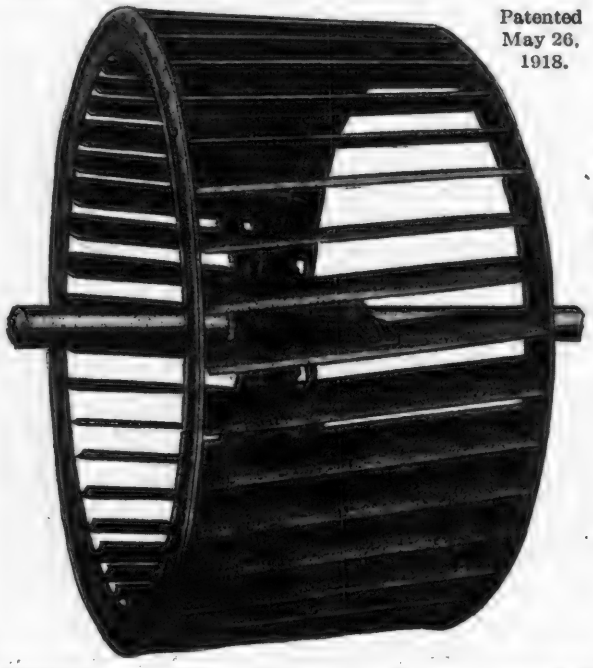

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## American Blower Company

DETROIT, MICHIGAN

BRANCHES IN ALL PRINCIPAL CITIES

of the difficulties being experienced by central station heating companies in securing adequate rates is given in the case of the Kansas City Heating Company. Last year the utilities commission established a test rate for this company to run from October to October. The company claimed that this rate was confiscatory and a petition is before the commission for a higher rate. The scale the commission established was lower than the company's charge and many consumers have sued for a rebate. Some criticism has been made by consumers of the "waiver" they are asked to sign but which the heating company claims is to prevent litigation when the new rates are allowed. The waiver reads as follows: "In making application for heat, I desire to advise that I know that your ability to supply is limited in quantity, and that the rates fixed by the public service commission are unreasonably low and confiscatory in their nature and character. It is not my purpose to involve the company in litigation. I believe the company should receive just compensation for services rendered. I do not believe the rates should be confiscatory. If you can comply with my request for heat I certainly shall be quite willing to compensate the company for the reasonable value thereof."

**New Incorporations.**

**General Heating Corporation of America,** New York, capital $150,000, to manufacture oil heaters, burners, etc. Incorporators: H. G. Collier, 1472 Broadway; B. D. Lorenz, Brooklyn; and S. L. Wentz, East Orange, N. J.

**Dew Valve Co.,** New York, capital $50,000, to manufacture steam valves, etc. Incorporators: M. H. Cooley, 317 West 119th St.; A. L. Wright, 128 Parkside Ave., New York; and T. F. Peterson, 226 East Third St., Brooklyn.


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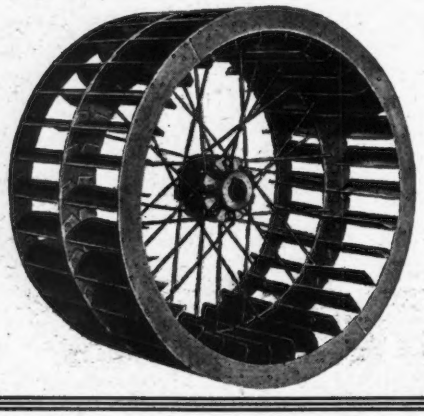

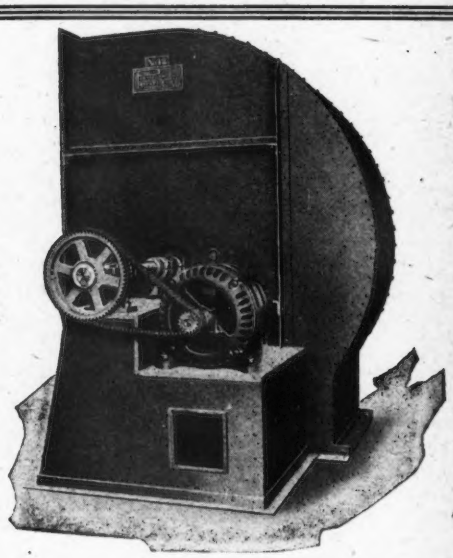

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For any desired temperature from 30o F. to 300o F., the SARCO Regulator is the simplest and most efficient device marketed. The power of the expanding oil, confined in closed space, is remarkable and secures definite, positive action at all times. No auxiliary power is necessary—no electricity, water, or compressed air lines are used and the elimination of these causes of failure puts the SARCO in a special class.

It is a power plant in itself, generating its own operating force with absolutely unfailing effect. The SARCO does not rely on expansion of metal, which changes in molecular construction, or volatile liquids, such as ethyl alcohol, which remain in uncertain equilibrium and sometimes decompose—it does not use levers, which magnify errors, nor rely on springs for its calibration and adjustment.

The SARCO is operated by a solid body of oil within a tube, this oil having a definite volume for any given degree of heat and changing in a fixed ratio as the temperature changes. There is nothing but this oil between the heat and the working valve. This is efficiency in its highest terms.

SARCO Temperature Regulators are everywhere in use for hot water service tanks, temperature control of offices, living rooms, dry kilns; also for chemical processes of a thousand kinds.

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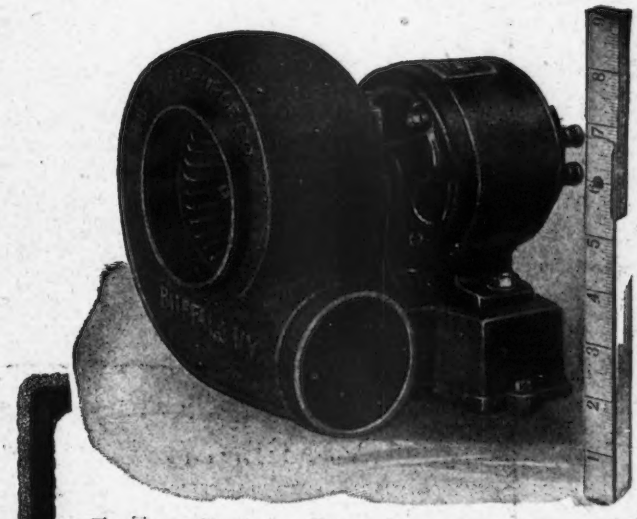

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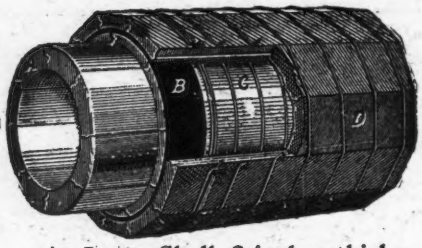


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**Atlanta, Ga.: 378 Piedmont Ave.**

### Employment Bureau for Engineers.

A central bureau for placing engineers in touch with available positions has been formed by the Engineering Council. It is known as the Engineering Societies' Employment Bureau and his headquarters in the Engineering Societies Building, 29 West 39th Street, New York. The bureau which is under the direction of Walter V. Brown acting as secretary, takes over the work done in this connection by the member engineering societies and deals especially with men in the service who are returning to civil life.

### Organization of "Associated General Contractors of America."

A significant step in the reconstruction movement is the organization recently of the Associated General Contractors of America. The general offices of the association will be located in Chicago, with possibly temporary headquarters in Washington. D. A. Garber, of New York, is the organization's first president. A platform was adopted by the convention covering the matters of ethics, mutual aid, co-operation with other associations, protection and proper publicity. By mutual aid, it was stated, is meant the exchange of information concerning proper cost accounting, reliable estimating, fair and reasonable allowances for depreciation of plant, conditions covering rentals, and terms as applied to equipment, etc. By co-operation with other associations, the Associated General Contractors plan to "maintain contact with commercial, engineering, architectural or other organizations."

"Protection," it is stated, "is often needed and should be furnished individual members against conditions arising from unfair legislation, bidding conditions, competition, specifications, plans, contracts, supervision and unfair labor conditions.

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